

NO QUARTER GIVEN: THE CHANGE IN STRATEGIC BOMBING
APPLICATION IN THE PACIFIC THEATER
DURING WORLD WAR II

A thesis presented to the faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
Military History

by

JOHN M. CURATOLA, Major, USMC
B.A., University of Nebraska, 1987
M.A., George Mason University, 2001

Fort Leavenworth, Kansas
2002

Approved for public release, distribution is unlimited.

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Major John M. Curatola

Thesis Title: No Quarter Given: The Change in Strategic Bombing Application in
the Pacific Theater During World War II

Approved by:

_____, Thesis Committee Chair
Christopher R. Gabel, Ph.D.

_____, Member
Joseph G. D. Babb, M.A.

_____, Member
Major Thomas J. Toomer, M.S.

Approved this 31st day of May 2002 by:

_____, Director, Graduate Degree Programs
Philip J. Brookes, Ph.D.

The opinion and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

NO QUARTER GIVEN: THE CHANGE IN STRATEGIC BOMBING APPLICATION IN THE PACIFIC THEATER DURING WORLD WAR II, by Major John M. Curatola, 118 pages.

European airpower theorists of the 1920's and 30's envisioned the deliberate bombing of civilians in order to affect an enemy nation's wartime production capabilities and national morale. However, American proponents of airpower were more exacting in their approach to the use of the airplane. The US Army Air Corps developed the idea of precision bombing as a means to destroy an enemy's ability to prosecute war through the targeting of only an enemy's means of production and state infrastructure while avoiding civilian casualties.

World War II provided the US Army Air Force (USAAF) the opportunity to prove the effectiveness of this theory. However, as the war progressed, the USAAF targeted not just centers of production, but political targets as well as civilian populations. Thus, USAAF bombing came to resemble the type of application that was initially proffered by European theorists. Large-scale bombing of cities and populations became the mode of operation for the USAAF in the Pacific. Despite its policies and doctrine, the USAAF deliberately bombed civilian populations in conjunction with the Japanese means of production. Why did this targeting change take place? How did the USAAF eventually come to conduct indiscriminate area bombing of civilians despite the perception that it was contrary to our national mores?

ACKNOWLEDGMENTS

I wish to thank my parents, Lieutenant Colonel and Mrs. Carl Curatola USAF (Ret.) who gave me life, love, and the ability to stand on my own two feet. Additionally to my wife Deb, and daughters Jenny and Katie, who provide me with an infinite amount of patience and support to all of my endeavors.

TABLE OF CONTENTS

	Page
APPROVAL PAGE.....	ii
ABSTRACT.....	iii
ACKNOWLEDGMENTS.....	iv
LIST OF ACRONYMS.....	vi
LIST OF ILLUSTRATIONS.....	vii
LIST OF TABLE.....	vii
CHAPTER	
PART I. BEGINNINGS	
1. INTRODUCTION AND THEORETICAL FOUNDATIONS.....	1
2. BOMBING APPLICATIONS IN THE EUROPEAN THEATER.....	14
PART II. APPLICATIONS	
3. NATURE OF THE TARGET.....	36
4. NATURE OF THE WEAPON SYSTEM.....	57
5. HUMAN NATURE.....	74
6. CONCLUSIONS.....	98
GLOSSARY.....	110
BIBLIOGRAPHY.....	113
INITIAL DISTRIBUTION LIST.....	118
CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT.....	119

LIST OF ACRONYMS

ACTS	Air Corps Tactical School
AWPD	Air War Planning Document
CBI	China, Burma, India
CBO	Combined Bombing Offensive
COA	Committee for Operational Analysis
CWS	Chemical Warfare Service
ETO	European Theater of Operations
HE	High Explosive
RAF	Royal Air Force
USSBS	United States Strategic Bombing Survey
USAAF	United States Army Air Force
USSTAF	United States Strategic Air Forces
VE	Victory Europe

LIST OF ILLUSTRATIONS

Figure	Page
1. H2X Radar Set.....	17
2. Japanese Winter Weather Pattern.....	37
3. Japanese Summer Weather Pattern.....	39
4. APQ-13 Radar Return of Osaka.....	40
5. M69 Incendiary Bomb.....	50
6. Comparison of B-29 to B-17.....	59
7. B-29 Climb Control Chart.....	67
8. Excerpt from <i>Leatherneck</i> Magazine.....	87
9. 20th Air Force Organizational Chart	91

LIST OF TABLE

Table	Page
1. Area Destroyed by 20th Air Force.....	52

PART I: BEGINNINGS

CHAPTER 1

INTRODUCTION AND THEORETICAL FOUNDATIONS

While there have been a number of military aviation developments during the twentieth century, World War II was arguably the single most important event leading up to the formulation and development of contemporary military aviation. Paramount to the aviation events occurring during World War II was America's strategic bombing campaign against the Axis nations. For three years, the United States Army Air Force (USAAF), in conjunction with its British allies, conducted an exhaustive and expansive effort to defeat the Axis nations by strategically bombing their war-making and industrial capacities. This air assault forever changed the way the world viewed airpower and created an entirely new dimension in the execution of war.

While conducting this bombing campaign, the USAAF professed an adherence to a doctrine that was uniquely American-precision daylight bombing. This doctrine was based upon the premise that a sufficiently defended bomber, in daylight, can conduct a precision attack on an enemy's war-making production and industrial capabilities. This doctrine, which emerged from the U.S. Army's Air Corps Tactical School (ACTS) in the 1930s, envisioned that bombers would fight their way to the industrial and administrative centers of the enemy and destroy the means of making war, thereby avoiding a long and bloody campaign aimed at defeating the hostile army.¹

While this doctrine was the initial premise for the American bombing effort, as the war progressed it became apparent that the USAAF had strayed from its professed

doctrine of precision bombing. By the end of the war in 1945, and concluding with the dropping of the atomic bomb, it was obvious that the USAAF had transitioned from high altitude precision bombing to practicing low level area and fire bombing against entire population centers. This area bombing effort stood in stark contrast to the beliefs of the American men who first developed the idea of precision bombing. Ironically, many of the men who designed the American concept in the 1930s were the same ones who lay waste the German and Japanese cities in the 1940s.

How a nation conducts war is often a reflection of the societal values it holds. America has long been a nation that prides itself on a sense of “fair play” and moral virtue. However, given America's military history, this pride may or may not be justified. Regardless of its validity, this professed allegiance to a sense of fair play and morality is a perception most Americans have about their nation and the way in which it prosecutes. Despite America's self-professed moral proclivity, area and fire bombing civilians eventually became the mode of operation for the American bombing campaign. The shift in American bombing applications originally began in the European theater of operations (ETO) and reached its culmination in the Pacific theater against the Japanese. In the ETO the change in American bombing application appeared to occur gradually and over a considerable period of time. While the United States Strategic Air Forces (USSTAF) in Europe certainly did conduct area bombing on German populations during the later months of the war, it had initially attempted to execute precision bombing in accordance with prescribed methods. The reasons for this change in bombing application by both the 8th and 15th Air Forces were many and were unique to that theater of operations.

However, the 20th Air Force in the Pacific theater abandoned daylight precision strikes in a much more expedient manner than its European counterparts. American bombing applications in the Pacific theater embraced area and fire bombing after only four months of subscribing to established USAAF doctrine.

The focus of this study will bear on the Pacific theater. The main questions to be discussed are: Why did this transition in the Pacific bombing campaign take place, and what was the impetus for it? How did the 20th Air Force come to the practice of low-level nighttime fire bombing of Japanese cities when only a few years before the idea of targeting a population was repugnant to American military planners? Why did the USAAF eventually conduct indiscriminate area bombing despite the fact that even Lieutenant General Laurence S. Kuter, Chief of the Air War Plans Division, stated that it was “contrary to our national ideals to wage war against civilians?”²

The answers to these questions are not necessarily only military ones, but ones that speak to American moral, legal, and cultural values. Through a study of the American bombing effort in the Pacific theater during World War II, the reasons for the transition provide insight into not only the military applications of the US, but also reveal something about American cultural mores.

Doctrinal Foundations

Military doctrine is simply a condensed expression of an accepted approach to campaigns, major operations, and battles. According to one historian, the general purpose of doctrine is to provide guides for action or to suggest methods that would probably work best and to facilitate communications between different elements by defining terms and providing concepts.³

In order to understand how and why the Americans executed the bombing campaign, it is important to understand its conceptual and doctrinal roots. These roots began with World War I and were born as a result of the trench-warfare experience in Western Europe. After World War I, military theorists believed that in the next war the airplane could prevent the kind of static, immobile trench warfare that had been recently experienced, thereby making war once again an effective instrument of national power.⁴ These theorists believed that the airplane and its unique capabilities could tip the balance of power in future conflict and secure victory. The most original and influential of these theorists was the Italian General Giulio Douhet who, even before World War I had begun, developed a fairly coherent doctrine of air strategy.⁵

Douhet believed that war was total and inclusive. As he saw it, conflict involved a nation's entire population, employing the entire human and material resources of the society. Toward this end, war was a struggle in which the distinctions between combatant and noncombatant vanished.⁶ Douhet believed that: "The battlefield can no longer be limited; it will be circumscribed only by the frontiers of the nations at war. Everyone becomes a combatant, for all are directly menaced. The classification into belligerents and non-belligerents can no longer exist."⁷

Men of Douhet's ilk believed that fleets of warplanes could head toward the vital centers of an enemy nation in order to paralyze and destroy them until the populace begged their government to surrender. In the future, bombers would spare the lives of soldiers by moving the battlefield from the trenches to the cities.⁸

Additionally, Douhet prophesized that war in the future would be conducted by aircraft dropping a number of different weapons upon large-scale targets. He felt that targets favorable to air attack are:

in general areas of large dimensions on which are found the usual buildings and a dense population. To destroy them, it is necessary to employ three types of bombs: explosive, incendiary, and toxic in suitable proportion. The explosive bombs produce the first ruins; the incendiaries produce fires that the toxic bombs prevent from being extinguished. In addition, the complete destruction of the objective produces, besides the material effect, a moral effect that may have tremendous reactions. It is sufficient to imagine what would happen among civilian populations of the other cities when the news had spread that the center attacked by the enemy had been completely destroyed and that no one could have been saved.⁹

What Douhet was alluding to is what became known as “morale bombing.” Morale bombing was the deliberate targeting of civilian populations of an enemy nation in order to influence their willingness to fight while simultaneously generating civilian casualties. This targeting of the population was specifically designed to encourage the enemy's civilians to influence their government to end the hostilities.

Douhet expressed no regret at the disappearance of moral distinctions between making war against civilians and attacking enemy armies. According to California State History Professor Ronald Schaffer, Douhet thought that nations must resign themselves to air attacks on their populated places in the same way an army commander resigns himself to the loss of troops when he knows that it is a way to secure victory.¹⁰ Under a Douhetian context, civilians were just as relevant a target as the factories and centers of production that were being bombed. The Italian urged his readers to confront the brutal facts of war and to view them “without false delicacy and sentimentalism.”¹¹

Historians have interpreted a compassionate tone within Douhet's ideas because he believed that decisive blows will be directed at civilians, that element of the countries at war least able to sustain them, and their deaths would come with merciful speed.¹² Despite the deaths of civilians, Douhet felt that an overall amelioration would take place with the use of airpower that would itself be more humane in the end. Toward this end, Douhet saw that future wars might prove more humane than those of the past because they might, in the long run, shed less blood.¹³

American thinkers during the 1930s had ideas that resembled those proffered by Douhet, but with an important distinction. Almost uniformly American theorists embraced the application of bombers against enemy cities, but made the distinction between combatant and noncombatants.

While many visionaries proffered ideas regarding the use of airpower in future conflicts, ACTS served as a “clearing house” of sorts for many of these ideas. ACTS, during the 1930s, served as the cradle for USAAF doctrine and the concepts created and articulated from this organization served as the foundation for the American air efforts during World War II.

It was at ACTS that the USAAF studied the raids conducted against civilians in China, Ethiopia, and Spain. While visionaries offered ideas and concepts, ACTS weighed the intellectual merit of airpower ideas and balanced them against real-world applications. From its position, the officers at ACTS had the advantage of hindsight in regards to the most-effective use of airpower, and from this position they developed their own ideas regarding bombing applications.¹⁴

An area of significant study at ACTS was the deliberate bombing of civilians. Through an analysis of world events, ACTS rejected the idea of deliberately targeting civilians. In a June 1940 lecture at the school, Muir S. Fairchild, the Director of Air Tactics and Strategy, remarked:

The Japanese bombing of Chinese cities had actually increased the morale of the Chinese nation, and was more responsible for unifying the populace than any other factor. For that reason, and because direct attacks on a population center produced only temporary results which did not build upon one another and had minimal effects on a nation's ability to make war, the school preferred a strategy of delivering selective precision attacks against the enemy's national economic structure.¹⁵

The application that the school advocated was the destruction of the enemy's national economy through attacks only on vital installations. ACTS argued that strategic airpower could contribute to victory or secure it by attacks on the enemy state, especially its economic institutions. Attacks need not be indiscriminate, but should be targeted against only a few components whose destruction would disrupt the functioning of the entire state. The enemy's will or capacity to fight would then collapse.¹⁶

The most influential of these American theorists was Brigadier General William "Billy" Mitchell. Mitchell too drew the line between combatant and noncombatant. In 1925 he insinuated the distinction by stating, "air forces will attack centers of production of all kinds . . . not so much the people themselves."¹⁷ He also envisioned that "the threat of bombing a town by an air force will cause it to be evacuated, and all work in the munitions and supply factories stopped."¹⁸ Mitchell's implicit avoidance of civilian populations and casualties during bombing was indicative of contemporary American thought at the time.

This same approach was discussed by General H. H. “Hap” Arnold, Deputy Chief of Staff for the US Army, and Brigadier General Ira C. Eaker, who in 1942 would serve as the first commander of the US 8th Air Force spearheading the American bombing campaign. In a 1941 text, these men wrote:

It is generally accepted that bombing attacks on civilian populations are uneconomical and unwise. The most economical way of reducing a large city to the point of surrender, breaking the will of resistance, is not to drop bombs in its streets, but to destroy the power plants that supply light, the water supply, the sewer lines. Humans are not priority targets.¹⁹

Notes from an ACTS conference in 1939 also rejected the idea of direct attacks against civilian populations. This rejection was reflected in an ACTS lesson plan that bluntly stated: Direct attack on the civilian populace is rejected as an air objective due to humanitarian considerations.²⁰ According to Major General Haywood Hansell, a chief proponent and a framer of the precision-bombing theory: “The idea of killing thousands of men, women, and children was basically in contrast to American mores and from a pragmatic view, people did not make good targets for the high explosive bomb, the principal weapon of the offense.”²¹ Interestingly, however, while texts concentrated on precision target systems, terror attacks were still considered by the school “as a possible means of retaliation.”²²

Avoidance of civilian casualties from air assault was also addressed by President Roosevelt, who in response to the bombing of Helsinki by the Soviets in 1939 stated: “The American Government and the American people have for some time pursued a policy of wholeheartedly condemning unprovoked bombing and machine gunning of civilian populations from the air.”²³ This statement by the Commander-in-Chief is

certainly explicit in its allegiance to the American premise that civilian casualties were to be avoided.

The American targeting of vital areas was also pragmatic from the standpoint that it maximized the limited resources of the Air Corps during the 1930s. Increasingly, airpower was seen as an attractive and cheap deterrent to the political situation that was developing. While precision bombing provided better publicity for America, it also fit with the new types of equipment that were being produced. The unveiling of the B-17 “Flying Fortress” bomber and other aircraft equipped with precision sights promised to fulfill the type of bombing envisioned by ACTS. Concurrently, the limited number of aircraft being produced also represented the best value for the Air Corps to get the most out of a shrinking budget.²⁴

This doctrine also served to set the stage for the validation of an independent air arm that could provide significant contributions in a future war. American theorists believed that a few bombers with selective targeting could neutralize an enemy's war-making capabilities both cheaply and quickly. This type of application obviously avoided the moral quagmire that Douhetian type attacks insinuated, and given the size and budget of America's 1930 era Air Corps, this idea had an attraction to a fiscally constrained nation whose air force was rather limited in both size and capability.

In addition to, or as a result of, the moral and objective arguments, the idea of precision bombing came about. This pro-Air Corps idea promised victory independent of other branches of the armed services with minimal demands on, and risks for, Americans by employing the bomber as an instrument of precision rather than indiscriminate horror,

laying its high explosives on its targets with pinpoint accuracy, incapacitating the enemy without slaughter.”²⁵

While the theory behind strategic bombing was susceptible to a number of interpretations, most American air planners viewed it as an application that would minimize civilian casualties while yielding military advantage. During the interwar years, American precision bombing theory largely included humanitarian considerations despite the application proposed by Douhet. While differing from their European counterparts regarding civilian casualties, American air theorists saw great potential in strategic bombing and began to include it into some war plans.

Air War-Planning Document-1

In the years before American involvement in World War II, ACTS was promoting the doctrine that would guide the USAAF in the conflict ahead. As discussed, this doctrine focused on destroying “carefully selected targets in the industrial and service systems on which the enemy people, their industries, and the armed forces were dependent.”²⁶ According to Historian Conrad Crane, “The clearest and most important enunciation of ACTS doctrine came in August 1941 in a document known as Air War Planning Document-1 (AWPD-1).”²⁷

Up to a point, the plan followed most recent ACTS doctrine. However, the plan did stipulate that enemy civilian populations would be included in the targeting process. While AWPD-1 did place civilians as the lowest priority, it clearly specified that American bombers would make civilians their objective when the timing was right. While the document did not specify when this targeting would happen, AWPD-1 did state

that, “The entire bombing effort might be applied toward this purpose when it becomes apparent that the proper psychological conditions exist.”²⁸

While AWPD-1 was updated as required as the war unfolded, unchanged was the inclusion of undermining and destroying the capability and will of the enemy to wage war. Despite precision bombing doctrinal theories, a placeholder in the AWPDs had been created that could be utilized for the application of Douhetian tactics. While the reasoning for this placeholder is apparent, conspicuously absent is an explanation as to why the framers of the AWPDs strayed from their stated doctrine and proposed Douhetian tactics as a means of ending the war quickly. If the theory of precision strategic bombing was correct, why did the men who wrote AWPD-1 feel the need to include morale bombings in their planning? Why did this apparent departure from USAAF doctrine appear in the primary planning document for the strategic bombing effort? This is a question yet to be answered.

¹B. C. Nalty, *Winged Shield, Winged Sword* (Washington, DC: Air Force History and Museums Program, 1997), 112.

²L. Kuter correspondence to H. Arnold, 9 August 1944, Box 153, General Carl Spaatz Papers, Library of Congress, Washington, DC.

³Conrad Crane, *Bombs, Cities, and Civilians* (Lawrence, KS: University of Kansas Press, 1993), 6.

⁴Ronald Schaffer, *Wings of Judgment* (New York, NY: Oxford University Press, 1985), 20.

⁵*Ibid.*

⁶*Ibid.*, 21.

⁷Giulio Douhet, “La Guerre del’ Air” (Air Warfare), *Les Ailes*, trans. by Dorothy Benedict (Washington, DC [1933], mimeograph copy), 24.

- ⁸Schaffer, 20.
- ⁹Douhet, 30.
- ¹⁰Schaffer, 23.
- ¹¹Giulio Douhet, *The Command of the Air*. trans. by Dino Ferrar (New York, NY: Coward-McAnn, 1942), 181.
- ¹²Schaffer, 23.
- ¹³D. C. Watts, *Restraints on War: Studies in the Limitations of Armed Conflict* (New York, NY: Oxford University Press, 1979), 60-61.
- ¹⁴Schaffer, 30.
- ¹⁵Air Corps Tactical School Lecture, 28 March 1939, file 248.2019A, Air Force Historical Research Center, Maxwell AFB, AL.
- ¹⁶Michael S. Sherry, *The Rise of American Air Power* (New Haven, CT: Yale University Press, 1987), 51.
- ¹⁷William Mitchell, *Winged Defense* (New York, NY: Putman and Sons, 1925), 16.
- ¹⁸Mitchell, 6.
- ¹⁹H. Arnold and I. Eaker, *Winged Warfare* (New York, NY: Harper, 1941), 134.
- ²⁰Air Corps Tactical School Text, *The Air Force*, 1 December 1935, para 28, file 248.101.1, Air Force Historical Research Center.
- ²¹Haywood Hansell, *The Strategic Air War Against Germany and Japan* (Washington, DC: Office of USAF History, 1986), 13.
- ²²*Ibid.*
- ²³R. Dalleck, *FDR and American Foreign Policy, 1932-1945* (New York, NY: Oxford University Press, 1979), 195.
- ²⁴C. Griffith, *The Quest* (Maxwell Air Force Base AL: Air University Press, 1999), 15.
- ²⁵Sherry, 53.

²⁶Haywood Hansell, "Harold George: Apostle of Air Power." in *Makers of the USAF* (Washington, DC: Office of USAF History, 1987), 79.

²⁷Crane, 24.

²⁸Air War Plans Division, Air War Planning Document-1, August 1941, Tab 2, Sec 2, National Archive, Record Group 225, College Park, MD.

CHAPTER 2

BOMBING APPLICATIONS IN THE EUROPEAN THEATER

With the attack on Pearl Harbor serving as the catalyst for America's entry into the war, the USAAF arrived in England in the spring of 1942. While the buildup of the 8th Air Force in Great Britain took some time, the arrival of American bombers and crews in England were cause for controversy. Apart from the cultural differences of the two Allies, there was a significant doctrinal difference between American bombing concepts and British applications.

By the end of 1941 the Royal Air Force (RAF) was the only means available for the British to strike back at Germany. However, the daylight RAF raids were proving too costly and night bombing too inaccurate for pinpoint targets. Faced with the need to take some offensive action to meet the public demand for retaliation and to justify the large resources invested in an independent air service, Sir Arthur “Bomber” Harris's Bomber Command adopted a Douhetian strategy for mass night raids on German cities to break civilian morale.¹

The issue regarding the types of bombing the Allies were to conduct came to a head at the Casablanca Conference in 1943. At the conference, the discussion between Winston Churchill and representatives of the USAAF regarding the use of bombers and their application resulted in the drafting of the “Casablanca Directive.” According to Major General Hansell:

This directive specified vigorous prosecution by both the British and American air forces toward a common grand strategic objective, optimizing the special strengths and capabilities of each air force toward a common goal. The directive endorsed both the American and British strategies for air power, and recognized

both the RAF experience and the American tactical doctrine. The 8th Air Force and RAF could cooperate as coordinate members of a team progressing toward a common destination. The RAF was free to continue its chosen air strategy and the 8th Air Force was free to pursue its doctrine of destruction of selective targets by daylight.²

From the first flight of American B-17 bombers over the Nazi homeland in January 1943 until the following autumn, the USAAF pursued a precision bombing strategy in accordance with its published doctrine. While the RAF continued night area attacks, the Americans hit small but significant military and industrial targets. However, the USAAF's application in both the ETO and in the Pacific Theater was to change significantly over the course of the war for a number of varied reasons.

Aiming

Initially, the European daylight precision bombing campaign made the use of an optical sight that required the bombardier aboard the aircraft to visually locate the target. For this, USAAF bombers were uniformly equipped with the Norden bombsight. American airmen had confidence in their equipment, and it was estimated that the Norden sight was six to eight times more accurate than the Mark XIV sight used by the RAF.³ The capabilities of the Norden sight were legendary at the time and had the reputation of being capable of putting “bombs in a pickle barrel.” Originally designed for the US Navy, the Norden was adopted by the USAAF and was so precise that bombardiers could drop bombs within 50 feet of a practice target from 20,000 feet in the clear skies above the dry lake at Muroc, California.⁴

However, it was not possible to approach such standards of accuracy under battle conditions imposed over Europe. The United States Strategic Bombing Survey (USSBS), which was conducted after the war to measure the effects of the Allied bombing efforts

stated in regards to precision bombing “many limiting factors intervened; target obscuration by clouds, smoke screens and industrial haze; enemy fighter opposition which necessitated defensive bombing formations, thus restricting freedom of maneuver; anti-aircraft defenses, demanding minimum time exposure of the attacking force in order to keep losses down; and finally time limitations imposed on combat crew training after the war began.”⁵ For all its capabilities, the potential accuracy of the Norden was irrelevant if the bombardier was unable to sight his aiming point in the cloudy, war-torn European skies.

Conventionally, the USAAF designated the “target area” as a circle having a radius of 1,000 feet around the aiming point of attack. While accuracy improved during the war, survey studies show that overall, only about 20 percent of the bombs aimed at precision targets fell within the target area.⁶ As evidenced, in World War II precision daylight bombing was not yet a technically feasible idea.

However, during the war the British had developed radar-bombing devices, which could enable a bomber to aim its ordnance through cloud cover or overcast. This development held much promise as Germany could experience cloud ceilings less than 3,000 feet in addition to having visibility less than 3 miles 35 percent of the time during fall and winter months.⁷ “H2X” (figure 1) as it was to be called was a self-contained radar device transmitting a beam that scanned the ground below and provided a map-like picture of the terrain on a cathode ray tube indicator.⁸

The first H2X mission in October 1943 proved a resounding success. Despite this promising initial application, suspicions remained regarding the new technology. Eighth Air Force Commander Brigadier General Ira Eaker still preferred selected daylight

bombing, although it was still better to bomb inaccurately than not to bomb at all during the foul winter weather.⁹ However, on 1 November 1943, he directed that “whenever daytime precision bombing attacks could not be staged, heavy bombers using radar should attack targets selected with their regard to their effects on the German Air Force.”¹⁰ This initiated the frequent use of radar bombing as a means of executing the strategic bombing offensive.

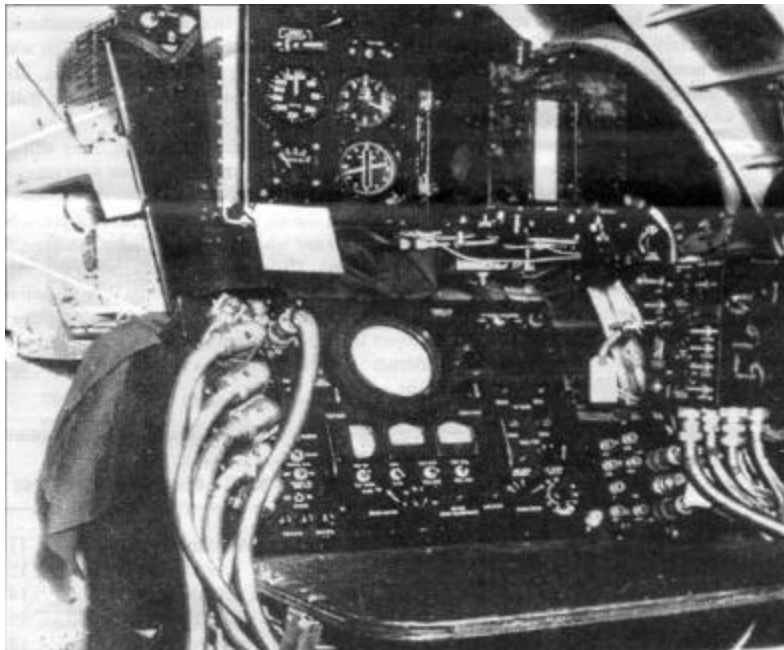


Figure 1. H2X Radar Set. Source: *486th Bombardment Group Photo Gallery*, (accessed on 4 January 2002); available from <http://www.486th.org/Photos/AC2/MkySet.html>; Internet.

Approximately 80 percent of the 8th Air Force missions during the last quarter of 1944 used some type of radar bombing device. The USSBS further stated that “despite the initial promise of H2X, analysis of these raids estimated that about 50 percent of these

missions were near failures or worse. Poor results stemmed from false returns from cloud static, increased crew fatigue from adverse weather conditions, and the difficulty in briefing radar missions.”¹¹

While the 8th Air Force used radar bombing against the German towns of Munster and Berlin, the American applications of H2X were usually employed against docks or marshalling yards and other features that were readily identifiable on radarscopes. However, there was no question that attacks utilizing H2X yielded poor accuracy results. Because of typical German fall and winter weather, nonvisual bombing remained an essential part of the USSTAF campaign despite its poor accuracy.¹²

Overlord Support

When General Eisenhower arrived in England in January 1944, he also brought with him strong convictions about the employment of strategic air forces.¹³ The paramount concern for Eisenhower was the invasion of Europe and the ground offensive that would take place after an amphibious assault of the Normandy Coast. This concern over the success of the second front had a serious effect upon the American bombing effort and the targets it selected.

In order to shape the battlefield prior to the commencement of Operation Overlord, the Allied invasion of Europe, Eisenhower advocated concentrating an air offensive against rail communications in France. According to Hansell, this involved targeting “some 75 to 110 rail bridges, marshalling yards, and maintenance facilities and was designed to make northern France a ‘railroad desert’ thereby hampering German movements to the Normandy beaches.”¹⁴ All Allied air forces, strategic as well as tactical, would be exclusively devoted toward this purpose. In the same process it was

hoped that the remaining fighters of the German Luftwaffe (air force) would arise to the challenge, “affording the opportunity to reduce enemy fighter forces through combat attrition.”¹⁵

On 13 February 1944, Eisenhower’s command issued a new directive regarding the Combined Bombing Offensive (CBO) which stated that the new objective was “the progressive destruction and dislocation of German military, industrial, and economic systems, the disruption of vital elements of lines of communication and the material reduction of the German air combat strength, by the successful prosecution of the CBO from all convenient bases.”¹⁶ This directive was the initial premise for Operation Point Blank and had broad implications. The inclusion of “lines of communication” and “material reduction of the German air combat strength through use of the CBO” was a significant departure from the concepts advocated by the AWPDs.¹⁷ Through this directive, the strategic bombing effort, as expressed in AWP, was now modified to start providing support for tactical operations.

While air commanders felt that Point Blank diverted assets from their primary mission, there is no question that the pre-invasion efforts sufficiently hampered German troop movement. In the words of General “Tooey” Spaatz head of USSTAF, the attack on German transportation “opened the door for invasion.”¹⁸ Even the USSBS noted that “at the time of the invasion itself, a systematic and large scale attempt was made to interdict all traffic to the Normandy beachhead. These operations were notably successful.”¹⁹

After the success of Overlord and the establishment of the Allied lodgment ashore, Eisenhower released control of USSTAF and RAF Bomber Command, and the

CBO was once again permitted to resume its air offensive. However, according to Hansell, “The strategic air forces continued to be diverted to the support of the ground campaign, and just three-fifths of their might was directed against the strategic targets in the interior of Germany.”²⁰

Attitudes

Through the feats of Charles Lindbergh, Amelia Earhart, and Roscoe Turner, civil aviation enjoyed great popularity during the interwar years. However, the USAAF and other air forces throughout the world were hard pressed to validate their existence as important military tools. The men who developed the AWPDs and filled the ranks of ACTS understood the merit of military aviation; however, at the time the national government and the general population saw aviation as a mere adjunct to the entire war effort.

Because of the apathy regarding military aviation, General Arnold saw the validation of the USAAF bombing effort as a requirement for his fledgling service. While many officers in the USAAF saw merit in their endeavor, much of the military establishment was still skeptical of an independent air arm. Arnold, who was dedicated to the establishment of an air force, independent of Army or Navy ties, saw the CBO as a tool by which to prove the necessity of an autonomous US Air Force.²¹ If the bomber offensive could be shown as an important tool in winning the war, it would not only help the cause of military aviation, but would also validate the existence of an independent air force.

In public Arnold called terror bombing of civilians and cities “abhorrent to our humanity, and our sense of decency” although he himself did not subscribe to this view

personally.²² In private he told his air staff that “this is a brutal war and . . . the way to stop the killing of civilians is to cause so much damage that their government ceases fighting.” He added, however, “This doesn't mean that we are making civilians or civilian institutions a war objective, but we cannot pull our punches because someone may get killed.”²³

He was impressed by the damage and civilian listlessness that a relatively small number of Luftwaffe bombers had caused in London, and he envisioned great results from larger fleets of American planes.²⁴ In response to a query from the Secretary of War regarding the catastrophic bombing of Dresden, Arnold wrote, “We must not get soft. War must be destructive and to a certain extent inhumane and ruthless.”²⁵

In order to avoid the public relations backlash when generating large amounts of civilian casualties while simultaneously cultivating popular support for an independent air arm, Arnold continuously walked a fine line between advocating the application of Douhetian-type tactics and a strict adherence to the doctrine of precision bombing. This ability to avoid public ire while still prosecuting his objective of validating USAAF efforts is evidenced in an axiom attributed to him during congressional hearings during the 1930s, “tell the truth, but don't blurt it out.”²⁶

In the first half of 1943 the gains of the 8th Air Force took the form of hard won lessons in tactics, politics, and critical analysis of strategic operations. Effective enemy fighter tactics and the 8th Air Force's inability to strike Germany with sufficient force dashed earlier hopes of demolishing the Luftwaffe.²⁷ As a result, the initial efforts of the CBO were not all that Arnold had hoped.

Though not involved in running day-to-day combat operations, Arnold's authority to relieve commanders gave him great leverage to influence their actions. Frustrated with the slow progress of the bomber offensive Arnold often vented his anger at subordinates and hectored his staff, especially Eaker, about a host of failings.²⁸

However, Arnold showed how personal and organizational anxiety provided one spur to the escalation of the air war. According to historian Michael Sherry, "It was not necessarily Arnold's intention to make the war more costly or brutal--but efficiency; the clean kill, promised large rewards for the USAAF Chief of Staff and his organization. Arnold's intentions and their results did not often correlate."²⁹ His motivation for the high rate of combat sorties and the proof of the strategic bombing concept lay with his main goal which was to make the largest possible contribution to winning the war and to ensure that the USAAF receive credit for it through proper publicity.³⁰

One example of Arnold's desire for results and media coverage is evident in a letter to Spaatz where the Commander of the AAF wrote: "The public reaction to our strategic bombing activities indicates that they are getting the impression that we are only partially destroying our targets and that the British are finishing the work which we have only started. Can't we, someday, not in the too far distant, send out a big number--and I mean a big number--of bombers to hit something in the nature of an aircraft factory and lay it flat?"³¹ Given the aforementioned personal views of Arnold and the emphasis he, himself, added in this document, it could be inferred that the large number of bombers Arnold wanted would destroy more than just an aircraft factory.

Despite the fact that Arnold's views on the application of bombers was publicly in line with USAAF doctrine, his desire for media coverage, demand for results, and

badgering for increased sortie rates eventually led to bombing that fell out of the purview of precision.

While Arnold's motives regarding bombing were less humanitarian than publicly shown, he was not alone in embracing Douhetian applications. Eisenhower, himself, was a proponent of such actions, as long as they would hasten the end of the conflict.

Eisenhower's advocacy of actions that would expedite the end of hostilities was apparent when Spaatz approached him in August 1944 regarding the bombing of Berlin in Operation Thunderclap.

Thunderclap was designed to be a massive assault against the center of Berlin and was presented by the RAF as a way of changing the mental state of the German high command. The idea was to provoke unprecedented terror by saturating the core of the Nazi capital during daytime with so many bombs that no one could imagine escaping death. This would not only destroy the country's administrative center, but would make an impression upon millions of people nearby who would witness the attack.³²

The operation plan for Thunderclap stated, “during daylight the population of the area to be bombed was high. With an attack on the scale envisaged it is estimated that 275,000 people would be killed or seriously injured.”³³ A specifically Douhetian application was included in the Thunderclap plan that specified that the “whole population of Berlin would be spectators of the catastrophe, and, in the state of the war which has been postulated, the effect might be decisive.”³⁴

Spaatz disliked the premise behind Thunderclap and expressed his opinions to Eisenhower. On 24 August Spaatz reminded the Supreme Commander, “The US bombing policy has been directed against precision military objectives and not morale. I

am opposed to this operation as now planned. We are prepared to participate in an operation against Berlin, but in so doing will select targets for attack of military importance.”³⁵ To this Eisenhower responded,

While I have always insisted that the U.S. Strategic Air Forces be directed against precision targets, I am always prepared to take part in anything that gives real promise to ending the war quickly. The policies under which you are now operating will be unchanged unless an opportunity arises where a sudden and devastating blow may have an incalculable result.³⁶

On 9 September, Eisenhower directed Spaatz to be ready to bomb Berlin at a moment's notice, whereupon Spaatz informed the Commander of the 8th Air Force, that “we would no longer plan to hit definite military objectives, but be ready to drop bombs indiscriminately on the town” when Eisenhower gave the order.³⁷ This singular episode not only provides insight into the attitude of the Supreme Allied Commander, but is also telling of the willingness of the USSTAF Commander to conduct such raids. While Spaatz had reservations regarding this type of bombing application, his duty as a soldier required his execution of such a mission.

The interest in attacks on civilians was not exclusive to the members of the Army Air Forces. General George C. Marshall, Army Chief of Staff, who had also pushed Doolittle and Eaker for increased application of H2X bombing, was also interested in Douhetian applications and gave his endorsement to Operation Clarion which was a systematic campaign against the German populace and infrastructure.³⁸ Clarion was a proposal for systematic terror raids that “provided for a vast series of attacks by small groups of planes coming in at low altitude to bomb and strafe targets all over Germany.”³⁹

The rationale for the launching of this effort was concern over an apparent loss of momentum in December 1944. The Germans had launched an offensive in the Ardennes, which became known as the “Battle of the Bulge.” While the Allies effectively countered this German offensive, victory still seemed beyond reach. Coincidentally, a Soviet offensive was to begin in the second week of January. This offensive, combined with a final blow, as described in the AWPDs, strengthened hopes that the end of the war could be expedited.⁴⁰ As a result, Operation Clarion was linked to the planned Soviet offensive. In a 23 December, USSTAF staff meeting, General Spaatz told RAF Air Chief Marshall Tedder that the forces under US command “are set to carry out operation Clarion at a moment's notice . . . and are prepared to carry it out when called upon.”⁴¹

While Clarion did not prove to be the culminating blow, it certainly subscribed to a Douhetian application. Targets of Clarion could be considered military or civilian depending upon how an individual target was being utilized by the Germans. Given the situation at the time and Marshall's concern over a potential loss of momentum, the execution of Clarion was viewed, at the time, as a military necessity.

President Roosevelt himself was not opposed to this transition to Douhetian application, despite his earlier condemnation of the Soviet Union. The president thought that too many people in the United States and England erroneously believed that only a few Nazi leaders were responsible for what had happened, not the entire German nation. The president stated: “The German people as a whole must have it driven home to them that a whole nation has been engaged in a lawless conspiracy against the decencies of modern civilization.”⁴² Roosevelt wanted the Germans to understand that they were a defeated nation and felt that they must accept “the fact that they are a defeated nation,

collectively and individually, must be so impressed upon them they will hesitate to start any new war.”⁴³

On 9 September 1944 President Roosevelt wrote to the Secretary of War suggesting, “It would be valuable in connection with air attacks on Japan and for post war planning to obtain an impartial and expert study of the effects on Germany which was authorized in enlarged scale as the CBO at the Casablanca Conference.”⁴⁴ This request initiated USSBS.

In this survey the president wanted not only to capture data on enemy rates of production and problems associated with shattered infrastructures, but also hoped to obtain “some indication of the psychological and morale effect on an interior community.”⁴⁵ The dispatch originated with the AAF, but when the president signed it and sent it to the Secretary of War, he also tacitly sent out a signal to everyone conversant with the morale bombing controversy that they could understand: attacks aimed at terrorizing enemy civilians were acceptable to the Commander in Chief.⁴⁶

The attitudes of men, like Arnold, who pushed for bombing results, Spaatz who executed area type attacks, Eisenhower and Marshall, who saw merit in Douhetian application, combined with the implicit approval of the president all contributed to the transition. While their rationales were entirely pragmatic given the situation, there is little doubt that their individual and collective influences facilitated the movement from precision attack.

Ancillary Influences

The transition of the USAAF to Douhetian application was not only the result of the aforementioned causes and situations, but was also facilitated by other factors and

influences. As mentioned earlier, the framers of the AWPDs envisioned the possibility of targeting populations and bombing large-scale areas. The placeholder in the AWPDs that envisioned the targeting of the civilian populace became a reality not only because of the reasons discussed, but was also facilitated by a number of lesser influences. While the following did not in themselves create the transition they, like the oil that lubricates an internal combustion engine to produce power, served to help ease the transition toward a Douhetian application.

When first suggested, the idea of precision bombing was based upon an Air Corps that was limited in size, budget, and capability. As stated earlier, a powerful argument for precision bombing in the prewar years and early in the war arose from the shortage of planes, crews, and bombs. America's long-held aversion to large standing armies as well as economical considerations limited the amount of firepower resident in the fledging Air Corps. As a result, daylight precision bombing was seen as a way to maximize the punch a small number of aircraft would have on an opponent.

In July 1939 the Army had only sixteen heavy bombers on hand. That number increased to only ninety-two by the time of Pearl Harbor two years later.⁴⁷ However, by the time the 8th Air Force established itself in England in the fall of 1942, the number of heavy bombers available had increased to 1,433.⁴⁸ Upon conclusion of European hostilities, the number of heavy bombers available to the USAAF had skyrocketed to 12,718.⁴⁹ This same trend is evident with all types of aircraft, such as medium bombers, fighters, and other required airframes, as well as with aircrews and other supporting equipment.⁵⁰

When the size of the bombing fleet grew, the idea of using large numbers of aircraft became more plausible. With so much firepower available later in the war, it was easier to believe that morale bombings, as envisioned by Douhet and in the AWPDs, could now be conducted. While ACTS had envisioned this type of application and the AWPDs listed it as a last priority, the size of the USAAF in 1944 to 1945 now permitted such an application. With the large armada of 1944 to 1945, the USAAF could now hit the remaining strategic targets available and still send hundreds of bombers on morale attacks, an impossible feat in the early stages of the war.⁵¹ In this regard, mass itself became a factor in the transition.

Another motivation for the transition in the ETO was the desire to reduce US casualty rates. Since bombers inherently contained more firepower and could therefore inflict more damage on the Nazi State, they were seen by some as a catalyst for the resolution process. Much like Douhet had envisioned regarding airpower's ability to shorten wars, the Americans felt that strategic bombing could facilitate a reduction in American casualties while simultaneously creating sufficient enemy fatalities that would result in a shorter war.

Even in such Douhetian applications as Operation Thunderclap, the sparing of Allied forces was one of the intentions. The opening paragraph of the Thunderclap operations order speculated, "If the operation should succeed in curtailing the duration of the war by even a few weeks it would save many thousands of Allied casualties and would justify itself many times over."⁵²

General Arnold believed that the American people at home wished to employ US technology to limit American casualties.⁵³ Most of the men conducting the CBO

professed to be in favor of limiting “unnecessary” casualties and destruction, but they held differing opinions as to what that entailed. As British historian Michael Howard has noted, “Those responsible for the conduct of state affairs see their first duty as being to ensure that their state survives; that it retains its power to protect its members and provide for them the conditions of a good life. When in doubt, leaders tended to do what was best to win the war and protect American citizens, whether those citizens were factory workers or bomber pilots.”⁵⁴ As discussed later, this same rationale is also evident in the Pacific theater and it too contributed to the transition to area bombing by the 20th Air Force.

While Americans professed to be precise with their bombing efforts, eventually through enemy resistance, along with greater success of certain RAF raids, the USAAF came to alter its approach. This approach, while still conducted in daylight, eventually began to resemble that of its British Allies. While British influence itself did not cause the transition, it, like the desire to avoid Allied casualties and the ability to use mass as a weapon, all served to facilitate the transition to Douhetian warfare by the USAAF.

Legacy for the Pacific Campaign

The CBO in the ETO provided invaluable experience for the USAAF and had a direct impact upon the conduct of 20th Air Force operations in the Pacific. According to Hansell, the strategy underlying the bombing of Japan was similar to that applied against Germany: “To defeat the enemy air force and to weaken the Japanese capability and will to fight as to cause capitulation or permit occupation against disorganized resistance, failing this, to make an invasion feasible at a minimum cost.”⁵⁵ In conjunction with this

strategy, a number of other legacies from the CBO had a direct impact upon the Pacific Theater bombing campaign.

During the interwar years the United States had developed a number of war plans in order to design strategies for possible future conflict. War Plan Orange, as it was called, was developed in case hostilities broke out between the US and Japan. This war plan made no provisions for the use of strategic airpower in the defeat of Japan nor for the landing of ground forces on the home islands. It did, however, envision the defeat of Japan by “isolation and harassment,” through the disruption of its vital sea lines of communication, and by “offensive sea and air operations against her naval forces and economic life.”⁵⁶ These basic planning assumptions included in War Plan Orange came into being by spring 1945.

According to Hansell, the aerial mining of Japan, combined with the strategic bombardment, had been a huge factor in the isolation and harassment of Japan. In this effort, the 20th Air Force flew over 1,528 mining sorties, laid over 12,000 mines, and accounted for the destruction of 770,000 tons of shipping in the waters adjacent to the island nation.⁵⁷ This isolation combined with the destruction of the Japanese means of production spelled doom for an empire that had at one time dominated the Far East. Thus, while airpower was not foreseen as a factor in War Plan Orange, strategic airpower using both bombs and mines came to play a significant role in making the envisioned conditions exist by summer 1945.

While the stated objectives for the Pacific bombing campaign were reflective of those of the CBO in Europe, the leadership for the 20th Air Force was composed of individuals who had gained their operational experience while in the ETO. Major

General Hansell and General Curtis LeMay, who were to command the XXIst Bomber Command on Tinian, both gained their operational experience in the ETO and developed ideas based upon this experience. While Hansell remained committed to the idea of daylight precision bombing, LeMay, who commanded the 305th Bomb Group in England, was keenly aware of the destructive potential of mass bombing and was instrumental in the development of incendiary bombing applications. Regardless of their differences, these men understood the capabilities and limitations of strategic bombing and brought their insights to the Pacific Theater.

Secondly, the American participation in operations such as Clarion and Thunderclap, had set a precedent for raids falling outside the purview of precision bombing. Once the USAAF had begun a transition to a Douhetian-type strategy, subsequent operations were more palatable to Air Force leadership. The targeting of civilian populations and area bombing was not as repugnant as it had been prior to 1943. This initial acceptance of nonprecision methods can be found in the AWPDs that created a placeholder for such applications. Adoption of these practices and their doctrinal inclusion facilitated the transition to area bombing in the Pacific theater.

Thirdly, the American air fleet was now of the size and capability to inflict massive amounts of destruction upon the enemy. The ability to employ large amounts of aircraft that could drop thousands of tons of bombs upon an enemy became a reality during the war. America's small prewar bomber fleet had grown exponentially in only a few years and now had the ability to conduct massive air raids. Toward this end, mass itself became a means to an end as the USAAF began to utilize its massive fleet to the greatest effect possible. Because the USAAF could inflict this scale of damage, it sought

to do so. This same approach is resident in the Pacific Theater as more and more B-29s with their increased bomb loads rolled off of American assembly lines.

Lastly, the desire to avoid American casualties also had relevance. Just as in Europe, as the war in the Pacific raged, more and more Americans were losing their lives. Perceived fanaticism of the Japanese escalated American fears that an invasion of the home islands would be a bloody affair. Since the utilization of airpower in Europe helped to offset potential Allied casualties, this same line of reasoning would be applied to the Pacific campaign.

The change in USAAF strategic bombing practice in the Pacific war had its origins in Europe. USAAF leadership experiences combined with bombing applications and technological limitations of the weapons used provided fertile ground for a change in bombing methods. With this European experience as a foundation, the 20th Air Force had a departure point for the development of more lethal and destructive methods of bombing. Those experiences in Europe, which were paid for at a high price by Allied aircrews, facilitated the devastation that was to be experienced by the Japanese nation in 1945.

¹Crane, 18.

²Hansell, *The Strategic Air War against Germany and Japan*, 72-73.

³Crane, 41.

⁴Roger Freeman, *The Mighty Eighth* (New York, NY: Orion, 1970), 1.

⁵United States Strategic Bombing Surveys (USSBS), *(European War) (Pacific War) Summary Report* (Washington, DC: US Government Printing Office, 1945; reprint, Maxwell AFB, AL: Air University Press, 1987), 13.

⁶Ibid.

⁷Federal Climate Complex, International Station Meteorological Climate Survey, Ver. 4.0, National Oceanographic and Atmospheric Association. Ashville, NC, 1996.

⁸Combined Chiefs of Staff, Special Meeting notes 71-86, 29 April 1943, Record Group 218. National Archives. College Park, MD.

⁹Schaffer, 67.

¹⁰Combined Chiefs of Air Staff Plan for the Defeat of Germany, Memo from Commanding General USAAF, 1 November 1943, Box 39, General H. H. Arnold Papers, Library of Congress.

¹¹Crane, 72.

¹²Sherry, 162.

¹³Hansell, *The Strategic Air War Against Germany and Japan*, 104.

¹⁴Ibid.

¹⁵Ibid.

¹⁶Ibid., 177-178.

¹⁷Ibid.

¹⁸Ibid., 110.

¹⁹USSBS, *Overall Report* (European War) (Washington, DC: US Government Printing Office, 30 September 1945), 61.

²⁰Hansell, *The Strategic Air War Against Germany and Japan*, 112.

²¹Crane, 34.

²²Sherry, 151.

²³Ibid.

²⁴Crane, 33.

²⁵ Laurence Giles to H. Arnold, correspondence, 7 March 1945, 22 January-March 1945 folder, Box 223, Arnold Papers, Library of Congress.

- ²⁶Dewitt S. Coop, *Forged In Fire* (Garden City, NY: Doubleday, 1982), 5.
- ²⁷Sherry, 150.
- ²⁸*Ibid.*, 151.
- ²⁹*Ibid.*
- ³⁰Crane, 34, 38, 59.
- ³¹H. Arnold to C. Spaatz, correspondence, 24 January 1944, Box 14, Spaatz Papers, Library of Congress.
- ³²Schaffer, 63.
- ³³Operation Thunderclap Folder, Annex 1, 20 August 1944. Box 153, Spaatz Papers, Library of Congress.
- ³⁴*Ibid.*
- ³⁵*Ibid.*
- ³⁶Supreme Headquarters Allied Expeditionary Force correspondence to C. Spaatz, 28 August 1944, Box 18, Spaatz Papers, Library of Congress.
- ³⁷*Ibid.*
- ³⁸Schaffer, 87.
- ³⁹Operation Clarion Plan, 17 December 1944, file 670.430-3, February 1945, Air Force Historical Research Center.
- ⁴⁰Schaffer, 94.
- ⁴¹Staff meeting notes, 23 December 1944, Box 16, Spaatz Papers, Library of Congress.
- ⁴²Dalleck, 472-73.
- ⁴³*Ibid.*
- ⁴⁴USSBS, *Summary Report*, ix.
- ⁴⁵Schaffer, 89.

⁴⁶Ibid.

⁴⁷Office of Statistical Control, *Army Air Force Statistical Digest for WW II* (Washington, DC: US Government Printing Office, December 1945), 135.

⁴⁸Ibid.

⁴⁹Ibid.

⁵⁰Ibid.

⁵¹Schaffer, 83.

⁵²Operation Thunderclap Folder, Annex 1.

⁵³Schaffer, 104.

⁵⁴M. Howard, *Studies in Peace and War* (New York, NY: Viking, 1971), 238.

⁵⁵Hansell, *The Strategic Air War Against Germany and Japan*, 141.

⁵⁶Lewis Morton, "Germany First: The Basic Concept of Allied Strategy in World War II" in Pub 70-7, *Command Decision* (Washington, DC: Center for Military History, 1959).

⁵⁷USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan, Final Report (Twentieth Air Force)* (Washington, DC: US Government Printing Office, 1 September 1946), 31.

PART II: APPLICATIONS

CHAPTER 3

NATURE OF TARGET

The Pacific strategic bombing campaign focused largely upon the destruction of war production and support facilities located on the Japanese home islands. Despite the fact that the nation of Japan was poor in natural resources and had to import most of its raw materials, the USAAF focused the majority of its efforts toward production and population centers located on the islands of Japan. As stated in the Joint Chiefs of Staff (JCS) Directive 742/12, the primary mission of the 20th Air Force was “to achieve the earliest possible dislocation of Japanese military, industrial, and economic systems, while undermining Japanese morale.”¹ This statement focused the strategic bombing effort directly against the home islands of Japan, the infrastructure located there, and the populations that inhabited the Japanese nation.

The geographic location of Japan on the globe and the unique meteorological conditions over the island chain had a direct impact upon the manner in which the 20th Air Force executed its strategic bombing effort. Additionally, how the USAAF perceived the Japanese industrial organization and its means of production also affected the conduct of the US bombing effort. Furthermore, the Japanese method of construction and city development was also a factor in planning the Pacific bombing campaign. All three of these elements collectively contributed to the unique nature of the target. This uniqueness of the Japanese home islands helped to contribute to the change in USAAF bombing practices in the Pacific theater.

Meteorology

While the technology for high-altitude bombing was coming of age during World War II, the weather still had significant implications upon the execution of a bombing campaign. Meteorological implications affected not only bomb flight dynamics and targeting, but were also a factor regarding aircraft formation, flight routes, and bombing run procedures.

The Japanese home islands experience two seasonal weather patterns--winter and summer. Both of these patterns adversely affected high-altitude precision bombing. The winter weather pattern (figure 2) has cold air from Siberia sweeping across the entire length of the Japanese islands that picks up considerable heat and moisture from the Sea of Japan.² When it reaches the Japanese coast, it yields clouds and precipitation on the windy northwestern slopes.³ As a result, meteorological conditions along this coast are not conducive to precision bombing.

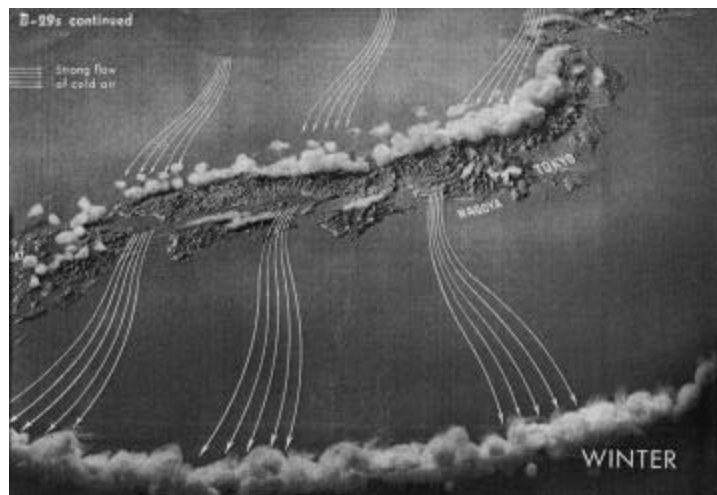


Figure 2. Japanese Winter Weather Pattern. Source: "The Weather Problem in Attacking Japan," *Impact* 3, no. 2 (February 1945): 48.

However, the Siberian air, dried as it ascends off the mountain backbone of the island chain and warmed as it descends on the other side, arrives clear and dry over the Japanese plains that face the Pacific.⁴ This weather situation is particularly favorable for bombing the important target areas in the southeastern coastal plains of Honshu and Kyushu, including Tokyo and Nagoya.⁵

While in winter there is a high probability of clear weather over targets near Tokyo, there was never any certainty of it.⁶ Despite the described winter weather patterns, actual meteorological conditions over the mainland of Japan at best presented marginal weather for daylight precision bombing. A listing of weather conditions reported during the first big-scale bombing missions over Tokyo and Nagoya, executed in the early winter of 1944, shows that weather problems exist even in this most propitious season.⁷

24 Nov., Tokyo. No Clouds 9/10 undercast.
27 Nov., Tokyo. Jap mainland completely cloud covered.
29 Nov., Tokyo. Solid undercast at target.
13 Dec., Nagoya. 1/10 cloud.
18 Dec., Nagoya. 3 Sqns report CAVU [Ceiling And Visibility Unlimited] over target, 6 report 8/10-10/10 cloud.
22 Dec., Nagoya. 6/10 to 10/10 cloud.⁸

In the summer months (figure 3) the cloud cover shifts to the Pacific side of the island chain as a weak flow of cool air circulating over the Sea of Japan converges with a strong flow of warm air coming from the Pacific.⁹ Where the warm air climbs over the cold air and on the mountain backbone of Japan, clouds build up to great heights and provide a protective summer blanket for targets, such as Tokyo.¹⁰ Off the Japanese coast, towering fronts sometimes solid with clouds from 1,500 to 30,000 feet also formed and

stood between the designated assembly point for the B-29s and their respective targets.¹¹ Thus, the summer weather pattern too, often precluded effective precision bombing.

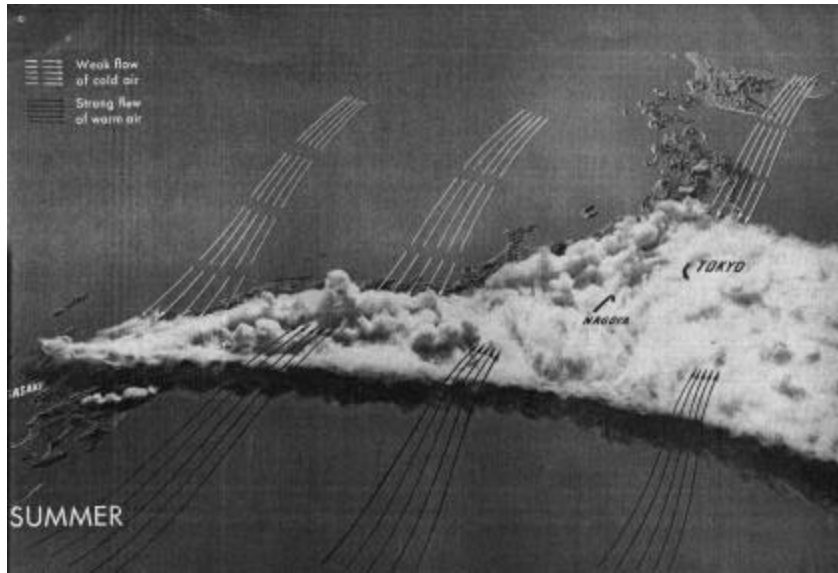


Figure 3. Japanese Summer Weather Pattern. Source: “The Weather Problem in Attacking Japan,” *Impact* 3, no. 2 (February 1945): 49.

Regarding the weather over Japan, LeMay wrote: “The weather at high altitude [over Japan] was unquestionably the worst bomber weather in the world.”¹² From altitudes of 25,000 to 30,000 feet, cloud ceilings averaging 6,000 feet often obscured Japanese targets. As a result, B-29 aircrews often placed less than 6 percent of their bombs within 1,000 feet of the designated targets. The damage produced by early B-29 raids was hardly worth the expense.¹³ Even LeMay’s predecessor as leader of the XXIst Bomber Command, Major General Hansell, understood the implications of Japanese weather on the strategic bombing effort and concluded that the preferred strategy (of precision optical bombing) could not be sustained in the face of continuous cloud cover.¹⁴

As a result of meteorological considerations, LeMay wrote General Arnold: “Weather continues to be our worst operational enemy. During my first six weeks here we had one visual shot at a target. This was primarily the reason I lowered the altitude for our incendiary attacks.”¹⁵ He went on further to state: “I am going to try lowering the altitude of our daylight attacks to get under the weather. If necessary, we will go clear down to the deck.”¹⁶ The USSBS also noted the meteorological problem and stated that “weather constituted the most serious obstacle confronting our combat units.”¹⁷

As mentioned earlier, radar-bombing methods were developed throughout the war to allow bombardiers the ability to “see” through clouds and overcast. However, as seen in the ETO, these early radars were less than accurate and even if a crew had trained with this new equipment, bombing results were usually unsatisfactory. Accuracy limitations of the APQ-13 radar, which was the system installed on the first B-29s to see combat, could not successfully bomb pinpoint targets from high altitudes.¹⁸ Figure 4 is an example of the APQ-13’s poor quality radar return.

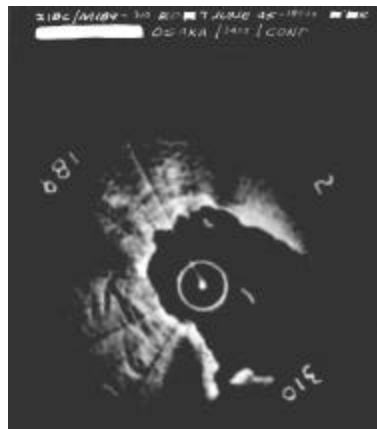


Figure 4. APQ-13 Radar Return of Osaka. Source: *40th Bomb Group APQ-13 Radar Scope Mission Photos*; available from [http:// www.40thbombgroup.org/hicks2.html](http://www.40thbombgroup.org/hicks2.html); Internet; accessed 4 January 2002;.

LeMay, too, concluded that the APQ-13 radar, utilized in the beginning of the Pacific bombing effort, was inadequate for high altitude precision bombing. However, with proper training of navigators and radar operators, it was found that low-level incendiary attacks presented an operation well within the capabilities of B-29 crews and equipment.¹⁹ In the last few months of the war, the USAAF began fielding the

APQ-7 “Eagle” radar that had ten times the power of resolution of the APQ-13. Despite the fact that a number of B-29s were equipped with the newer and more accurate APQ-7 radar, low level area bombing had already become a mainstay of the USAAF bombing effort in the Pacific.

In addition to cloud coverage, 20th Air Force crews were also experiencing their first contact with the phenomena known as the jet stream. The jet stream, which is a current of air racing at speeds above 57 miles per hour, circles the globe at altitudes similar to those used by B-29 aircrews. This river of high-altitude air contains winds that precluded effective and accurate high-altitude bombing of the Japanese nation.

These high winds over bombing targets were another stumbling block to bombing accuracy.²⁰ Wind velocities at 30,000 feet were as high as 230 miles per hour or about three times hurricane intensity. When bombing downwind, these winds made for aircraft ground speeds as high as 550 miles per hour, far beyond the maximum provided for in the USAAF bombing tables.²¹ Flying with the wind, a B-29 would pass over the target at a rate much too fast for World War II precision bombing techniques. Conversely, if a B-29 turned into the wind during its bombing run, its ground speed could drop to as low as 125 miles per hour, making it an easy target for Japanese fighter interceptors.²²

Since the jet stream could blow at over 200 knots at bombing altitude, high winds also forced the B-29s to drift in their bombing flight paths as much as 45 degrees.²³ While the Norden optical bombsight could correct for a 35-degree drift, the additional 10-degree drift experienced by the B-29s decreased the 20th Air Force's bombing accuracy appreciably.²⁴ As a result, B-29 aircrews were faced with a Hobson's choice of bombing inaccurately at a high rate of speed or fly at an unacceptably low speed and place themselves in a situation that compromised the safety of the aircraft.

In conjunction, the headwinds experienced by USAAF pilots while flying in the jet stream seriously affected fuel usage rates of the B-29. As a result of these headwinds, many B-29s ran out of fuel on the return trip back to their home bases because so many precious gallons had been consumed on the outbound trek. Additionally, fighting these headwinds also placed higher stress upon the B-29's four newly designed, Wright Cyclone, R-3350 air-cooled engines. These engines, which were initially fraught with mechanical anomalies, had a difficult time producing the power required to overcome the headwinds experienced at high altitudes. As a result of fuel starvation and engine failure, the 20th Air Force began to lose aircraft at a rate that was unacceptable.

Because of cloud coverage, the jet stream, and high winds, the USAAF was unable to conduct high altitude strategic bombing as it had done in the ETO. Meteorological variables alone precluded the type of bombing the USAAF had proffered in its prewar doctrine. However, meteorological conditions were not in themselves the sole reason for the transition.

Japanese Manufacturing Organization

By 1945 the USAAF had gained most of its strategic bombing operational experience through its efforts in the ETO by bombing Germany's industrial and manufacturing base. The German industrial base was organized with large manufacturing centers that were concentrated in selected areas. Once located, the 8th and 15th Air Forces initially focused their assaults upon the German homeland toward these selected manufacturing sites. While the USAAF eventually began to bomb other targets in the ETO that were not necessarily centers of production, the framers of the AWPDs and the leadership of the USAAF had hoped to focus their efforts on the means of war making in the enemy nation and not necessarily its populations.

However, unlike their Axis counterparts, the Japanese had begun to disperse much of their industry within the population centers of the nation and within civilian housing itself. While the Germans, too, had begun to disperse some of their industrial capacity, they did not do it to the extent of the Japanese system.²⁵ This Japanese system, for a time, included the use of home labor or cottage type industry to directly support the national war effort.

During the initial efforts of the Pacific bombing campaign, B-29 raids were largely directed against Japanese aircraft and aircraft engine production centers. These early raids produced enough damage to convince the Japanese that these plants would inevitably be destroyed.²⁶ The Japanese were thereby forced to conduct a wholesale production dispersal program.²⁷ As a result, the USAAF assumed that this method of production dispersal was a mainstay of the Japanese industry program and began to target entire urban areas.

According to General LeMay the Japanese model of production was intricate and complex. He described in his memoirs:

In Japan they would be set up like this: they'd have a factory; and then the families, in their homes throughout the area, would manufacture small parts. You might call it a home-folks assembly line deal. The Suzuki clan would manufacture bolt 64; the Harunobo family next door might be making nut 64, 65, or 63, or all the gaskets in between. These would be manufactured right in the same neighborhood. Then Mr. Kitagawa from the factory would scoot around with his cart and pick up the parts in proper order.²⁸

American planners knew of this Japanese method of production and deliberately targeted it. In a 1945 directive to the Commanding General USSTAAF concerning the bombing of Japan, the fourth primary objective listed was, "Complete the present program against industrial concentrations and stores located in urban areas."²⁹ This Japanese method of production was also known to General Arnold, who had to explain to the civilian leadership in Washington that "it was practically impossible to destroy the war output of Japan without doing more damage to civilians connected with the output than in Europe."³⁰

To the USAAF, this integration of the civilian population and their homes into the war-making effort expanded the definition of what was to be thought of as a target. To the military mind, targeting the Japanese civilian population and their homes made perfect sense. This integration of civilian populations and their homes into the war-making effort had grave consequences for the Japanese citizen. While areas of industrial concentration remained primary targets, the concept of workers as belligerents, which had been initiated in the ETO, had once again resurfaced to justify civilian casualties.³¹ Much like Douhet had envisioned in his theories, the separation between combatant and

noncombatant had disappeared. Both the factory and the home were now legitimate targets as well as the population itself.

LeMay understood the moral implications of bombing the urban areas and the homes that were located there. He knew that there was going to be the perception that the USAAF was conducting terror raids upon the Japanese populace. However, after the war, he responded to his critics by publicly stating:

We had to be realistic. The Japanese economy depended heavily on home industries, which were carried on in cities close to major factory areas. By destroying these feeder industries the flow of vital parts could be curtailed and production disorganized. By starting conflagrations in a city like Tokyo or Nagoya we would have a good chance of destroying some of the priority targets in those areas, and therefore make it unnecessary to knock them out by separate pinpoint attacks.³²

After the war, LeMay felt justified in his application of strategic bombing upon the Japanese nation. When visiting Japan in the days following the end of the war, he noted that:

All you had to do was visit one of those targets after we'd roasted it, and see the ruins of a multitude of tiny houses, with a drill press sticking up through the wreckage of every home. The entire population got into the act and worked to make those airplanes or munitions of war . . . men, women, children. We knew we were going to kill a lot of women and kids when we burned a town. [It] had to be done.³³

While in Yokohama LeMay again noticed the large part the Japanese civilian home-based manufacturing model had. He was impressed with the number of drill presses he saw in the city. They looked to him like "a forest of scorched trees and stumps, growing up through the residential area."³⁴ This integration of home industry into the Japanese production system enabled a pragmatic LeMay to validate his ideas regarding the fire bombing of Japan.

However, during the conduct of the USSBS it was found that these Japanese home industries were not as important as LeMay and the USAAF leadership had originally thought. While the Pacific bombing campaign focused part of its efforts upon Japanese home industries, these industries were not as prevalent by the time the Americans began the large-scale fire bombing of Japan. According to the USSBS:

The urban area incendiary attacks eliminated completely the residential and smaller commercial and industrial structures in the affected areas and a significant number of important plants, but a portion of the more substantially constructed office buildings and factories in those areas and the underground utilities survived. By 1944 the Japanese had almost eliminated home industry in their war economy. They still relied, however, on plants employing less than 250 workers for subcontracted parts and equipment. Many of these smaller plants were concentrated in Tokyo and accounted for 50 percent of the total industrial output of the city. Such plants suffered severe damage in the urban incendiary attacks.³⁵

While the USSBS minimizes the use of home industries into the Japanese war effort and addresses the elimination of this effort by 1944, this does not negate the notion that USAAF thought that the Japanese houses were legitimate targets. While the Japanese may have eliminated home production by 1944, USAAF planners had assumed that this practice of making parts in homes was still very much a part of the enemy's war making effort.

Additionally, the location of the smaller plants concentrated in urban areas still validated the USAAF targeting rationale. Since these smaller plants were still located in urban areas, USAAF planners would see the targeting of them as strategically sound and as a military necessity. Because these plants produced 50 percent of Tokyo's industrial output (according to the USSBS), these smaller factories would still, therefore, be considered legitimate targets by the USAAF regardless of their location.

Despite USSBS findings, the fact that the Japanese had at one time used homes in the manufacturing process and that smaller factories were located in urban areas, USAAF planners considered these factors during the construction of 20th Air Force target lists. The dispersal of Japanese production capability, whether in a house or in a small factory located in a residential area, helped to facilitate the change in USAAF bombing practices.

Japanese Urban Construction and Organization

In 1942, a group of military and civilian experts on industrial intelligence and target selection was put together to conduct special studies for General Arnold. This group included men from the Office of Strategic Services, Harvard and Princeton Universities, Massachusetts Institute of Technology, as well as a number of persons from the War Department. Called the Committee of Operational Analysis (COA), this group was staffed with persons who had considerable experience in analyzing large and complex problems.³⁶ These men had helped to develop targeting lists for the ETO, and in spring of 1943, they began studying Japan and potential targets located on the home islands.

By using economic and technical journals, Japanese media transmissions, and interviews of American and Allied engineers and businessmen who had built plants in Japan or lived in the Far East, the committee pieced together information about enemy systems that needed to be targeted.³⁷ In November 1943, the committee reported to General Arnold that the most important targets in Japan appeared to be merchant shipping, aircraft plants, steel, and urban industrial areas.³⁸

Furthermore, the COA believed that a series of massive firebomb attacks on urban areas would produce a major disaster for Japan, as these locations were highly congested

and flammable. This vulnerability of Japan to fire bombing was common knowledge to officers of the USAAF. In 1939 an ACTS course taught that “large sections of the great Japanese cities are built of flimsy and highly flammable materials. The earthquake disaster of 1924 bears witness to the fearful destruction that may be inflicted by incendiary bombs”³⁹

In 1942, Arnold's staff had already prepared target folders on Japanese objectives that were ranked in order of “vulnerability to incendiary attack.”⁴⁰ According to historian Conrad Crane, Arnold maintained on file a copy of a *Harper's* article emphasizing that Japan's main weakness was its concentration of industry in cities vulnerable to “the easiest and cheapest type of bombing--the broad casting of many small incendiaries over a comparatively wide area.”⁴¹ The piece pointed out that ramshackle combustible buildings sheltering small, dispersed industries would create conflagrations beyond the capacities of the local Japanese fire departments.⁴²

In June 1944, the COA established the “Joint Incendiary Committee.” The central task of the committee was to determine the force required to burn down the six major Japanese urban areas and to estimate the probable economic and military consequence of incinerating them.⁴³ In an effort to determine what was needed to destroy these Japanese urban areas, the USAAF constructed small villages representative of Japanese urban architecture at Eglin Field, Florida, and at Dugway Proving Grounds, Utah.⁴⁴

In Utah, the New York Architect Antonin Raymond, who had studied in Japan for eighteen years, was hired to design houses prepared to precise specifications that were very accurate in detail.⁴⁵ These houses were constructed in clustered units and represented the kind of neighborhoods found in Japanese urban areas. Called “little

Tokyos” these villages were to enable experts to evaluate the spread of fire in groups of buildings and to estimate the most destructive ratio of high explosives to incendiary bombs.⁴⁶ As a part of these tests, Army fire departments located at nearby posts were used to try to extinguish the fires set in these targeted villages.

In September 1944, the Incendiary Committee submitted its findings to the COA. It estimated that fire raids in Japan would do far more damage than those experienced by Germany where workers were less concentrated in urban areas and cities were not as flammable.⁴⁷ The findings showed that an attack on the major cities of Japan could destroy 70 percent of housing in the affected areas and kill more than one-half million civilians. The raids would also cost Japan 15 percent of its total manufacturing output and possibly an additional 5 percent for tank and truck parts.⁴⁸ Additionally, the committee concluded that fire attacks would disrupt transportation infrastructure, ruin storage facilities, make casualties of one out of ten workers, depress the civilian will to go on with the war, cause general social disorder, and achieve the cumulative effect of a major disaster.⁴⁹

In concert with the study of damage inflicted upon Japanese cities, American industry also began to design more effective and efficient incendiary bombs. Research efforts of DuPont, Standard Oil, and the National Research Defense Council resulted in the new napalm based M69 incendiary bomb.⁵⁰

Developed by Standard Oil, the M69 incendiary bomb (figure 5) was actually composed of 38 smaller six pound bombs tied together. Weighing a total of 500 pounds, the M69’s smaller clusters were strapped together inside a metal container, which was fused to break open at 2,000 or 5,000 feet and scatter the individual bombs.⁵¹ Three to

five seconds after the bomb would hit, an explosive charge ejected and ignited a sackful of jellied gasoline (napalm).⁵² The sack held the napalm in one spot thereby producing a hotter fire that was difficult to extinguish. When the M69 incendiary bomb was developed and dropped into the “little Tokyo” villages, Army fire-fighting departments were unable to extinguish the flames.⁵³



Figure 5. M69 Incendiary Bombs. Source: *B-29 Virtual Tour, Bombs and Weapons*. (accessed on 4 January 2002); available from <http://www.airandseamodels.com/demo/b29/tour-weapons.htm>; Internet.

In Europe, high explosive (HE) bombs were the mainstay of bomber loads. Because European cities were largely constructed of stone and masonry, incendiaries were not as effective as the HE bomb. Airmen in the ETO complained about the incendiary bombs as they felt that incendiaries wasted space in the bomb bays of their aircraft and reduced the destructive potential that bombers could carry to the enemy.⁵⁴ There were other problems with these early incendiaries as bombardiers complained about the difficulty in aiming these lighter incendiary bombs.⁵⁵ In addition to the ballistic

problems of the lighter incendiary munitions, they also proved to be vulnerable to damage during shipment.⁵⁶

However, by 1944, through the efforts of the Army's Chemical Warfare Service (CWS), these problems were solved and aimable clusters with improved packaging procedures had been developed.⁵⁷ Because of the ETO's preference for HE bombs, the full effect of these technological developments in incendiaries would not become evident until they were used in mass by the 20th Air Force.

By the end of the war, the incendiary had become the bomb of choice for the USAAF in the Pacific Theater. According to the USSBS, "70 per cent (of the strategic bombing effort in the Pacific) was devoted to incendiary bombing of urban industrial areas."⁵⁸ Conversely, only 22 percent of the bombing was done with HE bombs, while the remainder was accomplished with aerial mines.⁵⁹

In late 1944, the 20th Air Force conducted a number of experimental raids to test the effectiveness of incendiary bombing. On 18 December the XXth Bomber Command located in the China-Burma-India (CBI) theater launched a raid sending eighty-four B-29s in at medium altitude with 500 tons of incendiary bombs. The attack left Hankow, China, burning for three days, proving the effectiveness of incendiary weapons against the predominately wooden architecture of the Far East.⁶⁰ These early missions did much to perfect the incendiary campaign, and in March 1945, the results of these experimental raids yielded the most horrific air attack of the war.

On 9 and 10 March, the USAAF conducted its first low-level incendiary raid. Before it was over, between 90,000 to 100,00 people would be killed. According to Army historian Conrad Crane, the effects of this raid were stark:

Most died horribly as intense heat from the firestorm consumed oxygen, boiled water in canals, and sent liquid glass rolling down the streets. Thousands suffocated in shelters or parks; panicked crowds crushed victims who had fallen in the streets as they surged toward waterways to escape the flames. Perhaps the most terrible incident came when one B-29 dropped seven tons of incendiaries on and around the crowded Kokotoi Bridge. Hundreds of people were turned into fiery torches and “splashed into the river below in sizzling hisses.” One writer described the falling bodies as resembling “tent caterpillars that had been burned out of a tree.” Tail gunners were sickened by the sight of hundreds of people burning to death in flaming napalm floating on the surface of the Sumida River. . . B-29 aircrews fought the superheated updrafts that destroyed at least ten aircraft and had to wear oxygen masks to avoid vomiting from the stench of burning flesh. By the time the attack had ended, almost sixteen square miles of Tokyo were burned out and over one million people were homeless.⁶¹

Between 9 March and 15 June, a total of 6,960 B-29 sorties lifted 41,592 tons of incendiary bombs and razed 102 square miles.⁶² Table 1 indicates the damage to each city bombed as a result of these attacks:

Table 1. Area Destroyed by 20th Air Force

Area	Total Urban Area (square miles)	Planned Target Area (square miles)	Area Destroyed (square miles)
Tokyo	110	55	56.3
Nagoya	39.7	16	12.4
Kobe	15.7	7	8.8
Osaka	59.8	20	15.6
Yokohama	20.2	8	8.9
Total	246.2	106	102

Source: USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan, Final Report*, 1 September 46.

As a result of these attacks, the effectiveness of the incendiary bomb upon the Japanese nation was proven. Through an analysis of the table it can easily be seen that the COA, the Incendiary Committee, governmental and private corporations, as well as academia had all planned well when they developed the equipment and targeting priorities for the incendiary bombing of the Japanese nation. The development of incendiary weapons in light of Japanese construction and city planning methods worked against the Japanese nation to produce the type of bombing originally envisioned by Douhet. Toward this end, the composition and organization of the Japanese city also provided impetus for a strategic bombing application that fell out of the purview of precision bombing.

Summary

The Japanese home island presented unique challenges and opportunities for the proponents of airpower and strategic bombing. Faced with unique weather patterns that thwarted the use of high altitude precision-bombing methods, the USAAF had to develop other methods of dropping bombs on the Japanese home island. Further complicating the matter was the fact that Japanese industry was a widespread affair that was not neatly clustered like its Nazi counterpart. Because the Japanese had included, for a time, home industry, USAAF planners felt that targeting entire urban areas was required. Included with this was the fact that smaller “feeder” factories were also located in urban areas and this too contributed to the area bombing practices of the 20th Air Force. Lastly, because large areas had to be bombed instead of centralized locations, use of fire was seen as an effective and efficient weapon. Because of East Asian architectural practices, incendiary

weapons and the fires they produced became the primary weapon for the USAAF in its effort to destroy Japanese production and this nation's ability to prosecute war.

¹USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 2.

²“The Weather Problem in Attacking Japan,” *Impact*, 3, no. 2, (February 1945) 49; and Box 41, General Curtis E. LeMay Papers, Library of Congress.

³*Ibid.*

⁴*Ibid.*

⁵*Ibid.*

⁶*Ibid.*

⁷*Ibid.*

⁸*Ibid.*

⁹*Ibid.*

¹⁰*Ibid.*

¹¹Schaffer, 124.

¹²Curtis E. LeMay, speech notes, 19 November 1945, Box 41, LeMay Papers, Library of Congress.

¹³D. Haulman, *Hitting Home* (Washington, DC: Air Force History and Museum Program, 1999), 20.

¹⁴Hansell, *The Strategic Air War Against Germany and Japan*, 228.

¹⁵C. LeMay correspondence to H. Arnold, 5 April 1945, Box 11, LeMay Papers, Library of Congress.

¹⁶*Ibid.*

¹⁷USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 11.

¹⁸*Ibid.*

¹⁹USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 22.

²⁰LeMay, speech notes, 19 November 1945.

²¹*Ibid.*

- ²²Ibid.
- ²³Schaffer, 124.
- ²⁴Ibid., 124.
- ²⁵C. LeMay and Mickey Cantor, *Mission With LeMay* (Garden City, NY: Doubleday & Co, 1965), 385.
- ²⁶USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 84.
- ²⁷Ibid.
- ²⁸Ibid.
- ²⁹Enclosure Directive to Commanding General, United States Strategic Army Strategic Air Forces, Box 13, LeMay Papers, Library of Congress.
- ³⁰Crane, 135.
- ³¹Ibid., 133.
- ³²LeMay, speech notes, 19 November 1945.
- ³³LeMay and Cantor, 384.
- ³⁴Ibid.
- ³⁵USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 87.
- ³⁶Schaffer, 110.
- ³⁷Ibid.
- ³⁸Ibid., 111.
- ³⁹Crane, 126.
- ⁴⁰Ibid.
- ⁴¹Ibid.
- ⁴²Ibid.
- ⁴³Schaffer, 112-113.
- ⁴⁴W. Craven and J. Cate, *Army Air Forces in World War II* (Chicago IL: University of Chicago Press, 1953), 5:610.
- ⁴⁵Chester Marshall and Warren Thompson, *Final Assault* (North Branch, MN: Specialty Press Publishing, 1995), 125.

⁴⁶Ibid.

⁴⁷Schaffer, 116.

⁴⁸Ibid.

⁴⁹Ibid., 120.

⁵⁰Curtis E. LeMay, *Superfortress* (New York, NY: Berkeley, 1989), 122.

⁵¹“The M69 Goes to Work,” *Impact* 3, no. 4 (April 1945): 19; in *The Eve of Triumph* (Harrisburg, PA: National Historic Society, 1989).

⁵²Ibid.

⁵³Schaffer, 115.

⁵⁴Crane, 92.

⁵⁵Ibid

⁵⁶Ibid.

⁵⁷Ibid.

⁵⁸USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan* (Twentieth Air Force) *Final Report*, 16.

⁵⁹Ibid.

⁶⁰Haulman, 18.

⁶¹Ibid.

⁶²USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan* (Twentieth Air Force) *Final Report*, 14.

CHAPTER 4

NATURE OF THE WEAPON SYSTEM

The strategic bombing of Japan was conducted almost exclusively by a single weapon system, the B-29 Superfortress. The Superfortress alone had the range to strike the Japanese home islands and has been seen quite simply as the right tool at the right time.¹ The B-29 emerged from World War II as one of history's great airplanes.

However, for all the accolades attributed to the B-29, the deficiencies and limitations of this aircraft facilitated the transition to Douhetian warfare in the Pacific theater.

On 24 November 1944, 111 B-29s took off from Saipan in order to bomb the Nakajima aircraft engine factory near Tokyo.² This raid marked not only the beginning of bombing operations from the Marianas, but also was the start of the first phase of operations by the XXIst Bomber Command. In the next nine months, Marianas-based bombers would deliver 155,000 tons of bombs and mines on Japanese targets, most of which were more than 1,500 miles away from the point of take-off.³

According to the USSBS, the 20th Air Force conducted operations in the Pacific in a two-phased approach.⁴ The XXIst Bomber Command, which was one of two large subordinate organizations under the 20th Air Force, conducted Phase I from November 1944 to March 1945. This phase was characterized by the commitment to the doctrine of high-altitude, daylight-formation, precision bombing. This phase was largely based upon the strategic bombing model that had been developed in the ETO and then applied to the Japanese home islands. During this phase the USAAF sought to determine the operational capabilities of the B-29 and the best method of utilizing these capabilities in light of the enemy's vulnerabilities.⁵

Phase II, which occurred after the 10 March raid on Tokyo and was concluded on 15 August 1945, was devoted to the application of the tactical knowledge and experience gained during previous bombing raids. This phase saw the application of low-altitude, night incendiary bombing against urban areas and medium-altitude, daylight strikes.⁶

The application of bombing practices during Phase II came about not only because of the weather considerations over the Japanese home islands, but was also a result of the capabilities inherent in the design as well as the deficiencies and limitations of the B-29 airframe. Technical anomalies and design flaws, in addition to meteorological considerations, precluded the B-29's use for high-altitude precision bombing over Japan. These engineering problems inadvertently served as a catalyst toward larger more destructive bombing capabilities. Toward this end, the design of the B-29 itself was a significant contributing factor for the transition to Douhetian bombing.

Design Origins

At the time of its development the B-29 was the most sophisticated and complex airplane ever designed. Built in the wake of the B-17 and B-24, the Superfortress included a number of technological innovations that substantially improved the bomber's capabilities and flying qualities. While initial interest in larger bombers waned in the late 1930s, the outbreak of World War II renewed interest in large bomber design. As a result, in February 1940 a requirement for a "Hemispheric Defense Weapon" was issued.⁷

The First XB-29 made its maiden flight in September 1942. The new bomber's design was extremely clean, with no steps in the nose outline and specially streamlined engine nacelles.⁸ The airframe was powered by four R-3350, turbo charged engines that produced 2,200 horsepower each at take-off. The design featured self-sealing fuel tanks,

considerable armor protection, heavy defensive armament, and the ability to carry eight tons of bombs.⁹ The aircraft also included a pressurization system for crew comfort, a remote fire control system, specially designed four-bladed Hamilton propellers and hundreds of other minor but important engineering advances.¹⁰

The B-29 was the first “very heavy bomber.” Actually, in physical size it was not much larger than its B-17 or B-24 predecessor, but its weight and power was twice theirs. Its speed was also considerably greater (figure 6).¹¹ According to the *Aircraft Commander’s Manual for the B-29*: “It [the B-29] was built to do one particular job well, fly a long way with a big load of bombs.”¹²



Figure 6. Comparison of B-29 to B-17. Source: Headquarters Army Air Force, *Aircraft Commanders Manual for the B-29* (Dayton, OH: Otterbein Press, 1945), 5.

The design of the B-29 dovetailed with the requirements outlined in the AWPDs and was initially referred to in these documents as the very heavy bomber (VHB). AWPD-1 originally specified the requirement for over 2000 VHBs.¹³ This requirement envisioned using the VHB first in the ETO, which had the priority of effort for the Allies, then in the Pacific theater.¹⁴ Despite the fact that B-29s were never utilized in bombing operations in the ETO, the desire to have VHBs operate against Nazi Germany reduced considerably the time allotted to design, develop, and test this aircraft.

Expediency and Risk of the Design

A mockup aircraft of the VHB was approved in May 1941, and a month later Boeing received a letter of intent from the US government ordering 250 airplanes.¹⁵ The government's letter of intent was later modified in January 1942 to include another 250 planes. So important was the VHB to the American war plan that orders were placed for the B-29, and production lines prepared even before the new design had been flight tested by Air Corps officials. This decision to go into full rate production had occurred a full year before the first aircraft even took to the air.¹⁶

General Arnold, who had been a major advocate of AWPD-1, was an enthusiastic supporter of the VHB and a tireless proponent of the program. After the US became involved in World War II following the surprise attack on Pearl Harbor, Arnold's greatest concern was the progress of the B-29 project.¹⁷ Arnold, more than anyone else in the Air Corps, took the chances on the enormously expensive and speculative B-29 project.¹⁸

During the early phases of B-29 development, Arnold had to counter a number of critics in the War Department who had objected to the huge allocation of funds and resources dedicated to this singular Air Corps project.¹⁹ Arnold knew that the speed with

which he rushed the design and production of the Superfortress was a risk.²⁰ Only the B-26 Marauder medium bomber had been ordered “off the drawing board,” and it was built by only a single manufacturer. However, the B-29 was still just a “paper airplane” and was being ordered into production, but this time on an industry wide scale.²¹

For Arnold, the commitment to an unproven aircraft design was a momentous decision. If the B-29 program failed, it could well destroy the work of a lifetime and jeopardize the future of an independent US Air Force.²² The risk to build what was only a paper design was taken at the potential expense of Arnold’s personal and professional reputation. This calculated risk by Arnold would not only have a direct effect upon the B-29 design process, but would have an impact upon Arnold’s field commanders to produce results with the new weapon quickly.

Engineering Problems

The desire to produce and build the B-29 quickly had a number of implications that would affect its use in the Pacific campaign. Because the B-29 was so different from previously designed bombers, technical problems began to mushroom out of control.²³ The logistic problems inherent in producing an airplane as complex as the B-29 would have been difficult under the best of conditions, but the B-29 had to be designed, built, and produced quickly.

As soon as possible, B-29s rolled off the production lines. However, these early airplanes were built before a number of technical problems with the B-29 emerged. This led to the fielding of airplanes before a number of engineering changes were incorporated.²⁴ In 1944 alone there were fifty-four major modifications that had to be made to every B-29 that came off of the assembly line.²⁵ Areas requiring modification

included the electrical system, the tires, the fire control system, and the propeller feathering system.²⁶

However, the biggest problem affecting the performance of the B-29 was her newly designed R-3350 engines. After a number of B-29s had crashed in the CBI theater, engineers at Wright Field in Dayton, Ohio, began to investigate. After conducting trial runs and test flights, they determined that the R-3350 engines were overheating, primarily around the exhaust valves on the rear row of cylinders, causing a complete engine failure.²⁷

To correct this deficiency, fourteen new engine baffles were designed to blast cooling air directly onto the rear exhaust valves.²⁸ In addition, the top cowl flaps on each engine needed to be made operable from the cockpit, and crossover tubes from the intake to the exhaust port on the top five cylinders on both the front and rear rows needed to be installed.²⁹ These changes provided for a better flow of cooling oil and air around the engine.

Integration of an engine into an airframe is one of the most contentious engineering problems faced when developing a new aircraft. The marriage of airframe to powerplant requires the inclusion of several subsystems that adds complexity and can exacerbate existing design problems. In reviewing the documentation concerning the B-29 and the R-3350, it is evident that Boeing and Wright Aeronautical (the firm that built the engine) were not effectively communicating.³⁰ While the R-3350 eventually became a proven and successful powerplant, in 1944 this engine had several problems, and the Boeing designed installation amplified these deficiencies.³¹

In addition to the cooling problem, the R-3350 also had a tendency to “swallow” engine valves. This swallowing of a valve was the most common cause of engine fire for the B-29. LeMay described this problem like this: “A valve would burn, and then the head would go off and chew up one of the engines eighteen cylinders. Sometimes the cylinder would in turn fly off and chew up the whole engine.”³²

However, the most dreaded engine problem was an induction fire. This phenomenon was feared because once the magnesium alloy parts in the engine induction system started to burn they could not be put out.³³ Since magnesium burns at high temperature, existing fire extinguishing systems and procedures were ineffective. Therefore, when the magnesium parts caught fire, the fire usually burned through the engine’s firewall and into the wing, thus causing the entire wing to break off. Once that housing caught fire, the crew had approximately one minute to bail out.³⁴

The R-3350 also had a habit of losing hydraulic pressure, and the pilot would then be unable to feather the propeller. This inability to feather a propeller had dire consequences for B-29 aircrews. LeMay also addressed this problem: “If we lost hydraulic fluid and couldn’t feather the prop, the prop would fly off. You would be lucky if *just* the prop flew off, because sometimes the whole damned engine would seize and would twist right out of the wing.”³⁵

As a result of these and a number of other mechanical difficulties, over 2,000 engineering changes had to be made to the R-3350 engine alone.³⁶ After the war LeMay noted:

You do not draw a complicated, precision airplane like the B-29 out of a silk hat. The Air Forces had blueprints for [t]he B-29-but no blueprint ever dropped a bomb. So the B-29 was tested in combat. It is a tribute to the men who

planned and built it that this great airplane lived up to what was expected of it after a few modifications.³⁷

The number of problems that the B-29 experienced took years to correct, and the Air Force was still modifying and correcting this design twenty years later when the aircraft was finally retired in the late 1950s.³⁸

Operational Implications of the Design

The expediency of the design process helped to create the plethora of mechanical anomalies that plagued early B-29 operations. The technical problems and design flaws directly impacted how the 20th Air Force conducted bombing operations. These same problems also contributed to the changes in the methods by which the USAAF conducted its bombing campaign.

According to LeMay:

With the overheating engines, it began to seem that this high altitude stuff was strictly for the birds. The airplanes had been breaking down. There are something like 55,000 different parts in a B-29; and frequently it seemed that maybe 50,000 of them were all going wrong at once. I felt that the majority of our losses were due more to our own mechanical problems than they were to the Japanese defensive system. Main thing to do, it seemed, was to get them (the B-29) down in altitude. Then we'd get a lot more hours service out of each engine.³⁹

After studying mission reports, the first thing LeMay did was to bring the bombing formations down to a lower altitude over the targets, where the engines and other equipment would not be under such constant strain.⁴⁰ Early operational losses occurred mainly from mechanical failure.⁴¹ The long climb up to 30,000 feet stressed the R-3350 to the limit, which all too frequently resulted in the loss of the entire aircraft.⁴² By dropping B-29 cruising and bombing altitudes, wear and stress on the engines were reduced and operational availability of aircraft rose. The long climb to high-bombing

altitudes and the stress it put on the R-3350 could be negated if B-29 aircrews lowered their operating altitudes.

As a result of the drop in altitudes, maintenance “down time” was reduced and more bombers were available to conduct bombing raids. The decision to lower bombing altitudes also went hand in glove with the desire to avoid bombing through the difficult Japanese weather. However, this drop in operating altitudes was to yield a third and more deadly benefit for LeMay and the 20th Air Force.

In addition to the fire and valve problems, the R-3350 also did not produce the power necessary to fly the new bomber at its advertised payloads. Regardless of actual altitude, aircraft performance is largely dependent upon density altitude. Density altitude is the number of air molecules in a given volume. The higher the number of air molecules in a body of air, a low-density altitude, the better an aircraft’s performance. A high-density altitude equates to a low number of molecules and reduced aircraft performance (Density Altitude = Pressure Altitude + Air Temperature).⁴³

Hot and humid weather in the Pacific and CBI theaters results in high-density altitudes, combined with the weight of the B-29 and this mix had severe consequences for B-29 aircrew. In an October 1944 letter to Arnold, LeMay wrote:

To a large extent our bomb load is limited by gross take-off load. This is in turn influenced by operating technique, runways, high free air temperature and power available. The take-off is a very serious problem with the B-29, and is the high point of any flight. All crews, in discussing a mission, invariably talk about their take-off and not about flak, fighters or other enemy opposition. Even partial power loss from one engine almost invariably results in a crash from which there are very few survivors.⁴⁴

Later in the letter he further stated: “The B-29 airplane is capable of considerable higher performance than the R-3350 engine now installed will permit, as the maximum

gross weight is limited by power available for take-off and climb. Until more power is available, we cannot fully capitalize on the capabilities of the airplane.”⁴⁵

Because LeMay was anxious to increase aircraft sortie rates, maximize the capabilities of the B-29, and try to work around the uncooperative Japanese weather, bombing altitudes were reduced for yet another reason. The lowering of cruise and bombing altitudes allowed the B-29 to carry a larger bomb load. Because the B-29 was not climbing to higher altitudes, less fuel was required which meant that a higher bomb load could be carried.⁴⁶ According to LeMay:

One of the main advantages in going down to less than 10,000 feet over the target was the increased bomb load. We could increase the bomb load of each plane from about two and one-half tons to 10 tons. This was possible because each individual attack required no assembly into formation over the base at the start of the mission, and because aircraft would go directly from base to target and return, saving tremendous amounts of gasoline. Better weather would be encountered at lower altitudes and the heavy gas-consuming winds of high altitudes would be avoided.⁴⁷

When bombing by prescribed USAAF methods, the weight of bombs carried in the B-29 had to be reduced from ten to three tons because of the fuel needed to climb to and fly at higher altitudes.⁴⁸ An average B-29 used 7,000 gallons of gasoline on a mission. LeMay surmised that using over twenty-one tons of fuel to drop three tons of bombs did not make sense.⁴⁹ By lowering altitudes and negating the requirement to carry the fuel used for climbing to high altitude, bomb loads increased by a factor of four.⁵⁰

As depicted in figure 7, the amount of fuel a B-29 required to climb to bombing altitude, given a specified weight, was as much as 1,200 gallons of fuel (weighing 7,200 pounds) when climbing at a gross weight of 130,000 pounds. In order to compensate for

this fuel weight, power settings had to be increased for the long climb to altitude, creating an additional strain on an engine that already had enough problems.⁵¹

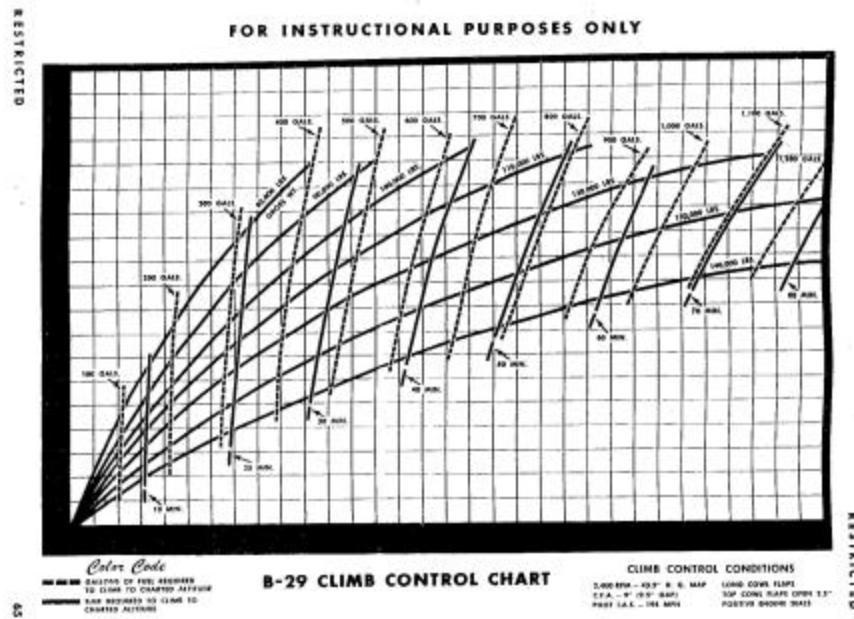


Figure 7. B-29 Climb Control Chart. Source: *Aircraft Commander's Manual for the B-29* (Dayton, OH: Otterbein Press, 1945), 5.

As a result, the B-29's high-altitude requirements necessitated the lowering of bombing altitudes, this in turn facilitated larger payloads that could increase the amount of damage exerted upon the Japanese Islands. Much like in the ETO, mass itself facilitated the transition to area bombing.

In addition to the mechanical difficulties of the B-29 design, the 20th Air Force was also plagued by a number of other maladies that degraded operational sortie rates. In January 1944, only one-half of the planes on each mission were able to bomb the primary targets. This was not only due to problems with the B-29 itself, but because of

poorly trained aircraft mechanics who were hampered by a chronic shortage of most everything.⁵² Additionally, maintenance facilities for the aircraft were also substandard.⁵³ This factor too contributed to LeMay's decision to lower bombing altitudes because the lack of maintenance space, spare parts, and trained mechanics limited the number the number of aircraft that could be repaired, thus affecting aircraft availability. As a result, aircraft were flown with maintenance consideration in mind.

It should also be noted that in order to increase bomb payload capacity further, for a time LeMay had his command remove much of the defensive armament from the aircraft.⁵⁴ The B-29s carried up to ten .50-caliber machine guns; and omitting their weight, in conjunction with the associated ammunition and the gunner who operated these weapons, created a weight savings that could be used for offensive armament. However, because of crew morale and security issues, LeMay eventually authorized the rearming of only the lower defensive turrets of the B-29s.⁵⁵

The complexity of the airplane's systems yielded a change in the mission profiles that the B-29 was expected to fly. This in turn contributed to the transition in USAAF bombing practices. Because the aircraft had design parameters that precluded its effective use at high altitude, bombing practices were altered in order to accommodate the new weapon system. The change had the added benefit of allowing more bombs to be carried, which then facilitated the transition of USAAF bombing effects.

Summary

Despite the fact that the B-29 was designed for high-altitude, precision bombing, the state of the 20th Air Force and the imperfect design of the airframe and powerplant integration mandated a modification to bombing doctrine. The USSBS noted:

The preceding 9 months had seen the B-29 committed in general to the doctrine of very high altitude precision bombing. Designed specifically for this type of operation, it was logical and mandatory that the doctrine be thoroughly tried before it was modified. Many factors militated against the achievement of this objective, among the foremost of which were insurmountable weather obstacles, strain imposed on equipment by high altitude operation, insufficient force, low sortie rate, and low bomb loads.⁵⁶

The USSBS went on further to note:

By lowering the bombing altitude, the effectiveness of each B-29 was increased tremendously. Bomb loads more than doubled; using radar bombing methods the weather ceased to be a serious factor; the number of aircraft dropping on the primary target soared from 58 to 92 per cent . . . decreasing bombing altitude meant less operating strain which added up to more sorties per air craft.⁵⁷

It should be noted however, that LeMay's decision to drop bombing altitudes initially had a negative effect upon his aircrew's morale. Since the USAAF's bombing experiences were based upon the ETO, the concerns over enemy fighters and flak were a major consideration. Crews worried about their chances of survival by flying so low. However, it became apparent as fire raids went over Japan that little opposition from Japanese air defenses would be encountered. In a speech given after the war LeMay commented that: "We decided to take advantage of what we thought was the Japs' unpreparedness for low altitude attack and exploited it."⁵⁸

Japanese flak was ineffective as the home islands had few low altitude flak concentrations, and their fighter force was too meager to thwart the American onslaught.⁵⁹ The inability of the Japanese to defeat a threat at low-to-medium altitude only encouraged the USAAF to continue its newly found bombing application.

The performance parameters of the B-29 coupled with the aforementioned nature of the target helped to facilitate the transition. For the USAAF, LeMay's change in doctrine from high-altitude precision to low-level area bombing was drastic. Many

USAAF personnel tried to talk him out of such a drastic step, but he had weighed the alternatives and went ahead.⁶⁰ He did not have to be told that the doctrine governing strategic bombing had not worked in the Pacific, he knew it.⁶¹

The limitations of the B-29 necessitated the use of lower altitudes, which in turn facilitated the hauling of larger loads of bombs. By summer 1945 much of the Japanese homeland had become a vast wasteland. Certainly one of the primary reasons for this was the substantial rise in the number of B-29s over the islands and the greatly increased bomb tonnage dropped on each mission. With lower altitudes, LeMay was able to raise the 2.6-ton load of each aircraft to 7.4 and keep more aircraft in the air.⁶² This capability to carry more bombing tonnage while having more aircraft operationally available meant more destruction for the Japanese homeland. Like its European counterpart, the Pacific bombing campaign began to utilize mass itself as a weapon.

¹LeMay, *Superfortress*, xiii.

²USSBS, *The Strategic Air Operation of the Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 9.

³Ibid.

⁴Ibid.

⁵Ibid.

⁶Ibid., 10.

⁷Christopher Chant, *World War II Aircraft* (London: Orbis, 1975), 112.

⁸Ibid.

⁹Ibid.

¹⁰Carl Beger, *B-29 Superfortress* (New York, NY: Ballentine, 1970), 32-33.

- ¹¹Ibid.
- ¹²Headquarters Army Air Force, *Aircraft Commanders Manual for the B-29* (Dayton, OH: Otterbein Press, 1945), 5.
- ¹³Hansell, *The Strategic Air War Against Germany and Japan*, 39.
- ¹⁴Ibid.
- ¹⁵Wilbur Morrison, *Point of No Return* (New York, NY: Times Publishing, 1979), 26.
- ¹⁶Ibid.
- ¹⁷Ibid., 28.
- ¹⁸LeMay, *Superfortress*, xiv.
- ¹⁹Morrison, 25.
- ²⁰LeMay, *Superfortress*, xiv.
- ²¹Morrison, 26.
- ²²Ibid.
- ²³Ibid., 58.
- ²⁴LeMay, *Superfortress*, 70.
- ²⁵Ibid.
- ²⁶Ibid.
- ²⁷Berger, 59.
- ²⁸Ibid.
- ²⁹Ibid.
- ³⁰Squire Brown, Research Volunteer, United States Air Force Museum, letter to Major John Curatola, United States Army Command and General Staff College, author's collection, 9 January 2002.

- ³¹Ibid.
- ³²LeMay, *Superfortress*, 79.
- ³³Marshall, 206.
- ³⁴Morrison, 34.
- ³⁵LeMay, *Superfortress*, 78.
- ³⁶Morrison, 58.
- ³⁷LeMay speech notes, 19 November 1945.
- ³⁸LeMay, *Superfortress*, 79.
- ³⁹LeMay and Cantor, *Mission with LeMay*, 343.
- ⁴⁰Morrison, 203.
- ⁴¹Graham White, *Allied Aircraft Piston Engines of World War II* (Warrendale, PA: Society of Automotive Engineers, 1995), 370.
- ⁴²Ibid.
- ⁴³Federal Aviation Administration, *Flight Training Handbook* (Washington, DC: US Government Printing Office, 1980), 324.
- ⁴⁴C. LeMay correspondence to H. Arnold, 19 October 1944, Box 11, LeMay Papers, Library of Congress.
- ⁴⁵Ibid.
- ⁴⁶White, 370.
- ⁴⁷LeMay speech notes, 19 November 1945.
- ⁴⁸Morrison, 208.
- ⁴⁹Ibid.
- ⁵⁰Ibid.
- ⁵¹Ibid.

⁵²Morrison, 212.

⁵³*Ibid.*

⁵⁴LeMay, *Superfortress*, 124.

⁵⁵*Ibid.*

⁵⁶USSBS, *The Strategic Air Operation of the Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 12.

⁵⁷*Ibid.*

⁵⁸LeMay speech notes, 19 November 1945.

⁵⁹Morrison, 216.

⁶⁰*Ibid.*, 217.

⁶¹*Ibid.*, 262.

⁶²*Ibid.*

CHAPTER 5

HUMAN NATURE

Despite all the technological and scientific rationales for the change in USAAF strategic bombing practices, some of the most compelling reasons for the shift from high-altitude, precision bombing to low-level area and fire bombardment are less pronounced and harder to define. While weather, city design and layout, flight characteristics, and operating parameters all had a hand to play in the transition, human fear, frailties, and desires were also in play. The willingness and zeal it took to create the conflagrations on the Japanese home islands were an overriding imperative towards the realization of Douhetian bombing. This willingness came from not only the military and civilian officials overseeing the conduct of the war, but was resident in the American populace and evident in its culture.

Though it was written before World War II and was classified during the conflict, in 1946 anthropologist Ruth Benedict published an in-depth study of Japanese culture and social organization. In the opening remarks of her work she stated:

The Japanese were the most alien enemy the United States had ever fought in an all-out struggle. In no other war with a major foe had it been necessary to take into account such exceedingly different habits of acting and thinking. . . . Conventions of war which Western nations had come to accept as facts of human nature obviously did not exist for the Japanese.¹

The cultural unfamiliarity illustrated by Benedict between the United States and the Japanese facilitated the change in bombing practices. The perception that the Japanese were less than human and worthy of annihilation was a prevailing theme in America's World War II popular culture. The cultural disparity not only facilitated the transition,

but also as the war progressed fueled the desire to inflict damage upon a nation that was unlike itself and altogether alien to contemporary American values.

While cultural issues were at play, both individual and collective agendas and concerns were also a factor. Many of these agendas, in retrospect, may now seem selfish or insignificant to the post-World War II generation. However, at the time of the war these collective and individual concerns were of paramount importance to the generation of Americans that defeated the Axis powers and the passage of time should not diminish nor trivialize the importance of these concerns.

Both the national collective will and a number of individual agendas had a significant role to play in the transition to low-level area fire bombing. These less tangible rationales for the change in USAAF bombing practices are not quantifiable, but are certainly alluded to, and evident in, official documents of the USAAF and the War Department as they are in the texts, pictures, and other manifestations of American popular culture of the time.

Avoidance of Casualties and Expedience

By March 1945, the United States had been engaged in World War II for just over three years. While the United States had served as an economic and industrial base for the Allied cause, it had not suffered, statistically, the number of casualties other nations involved in the war had faced. According to Roosevelt biographer James MacGregor: “Compared with Soviet, German, and British losses and considering the range and intensity of the effort and skill and fanatical resistance of the enemy, American casualties were remarkably light.”² Despite this fact, Americans were keenly aware of the

casualties generated in both the ETO and in the Pacific and of the number of gold stars hanging in the front windows of some US homes.

By 1944, the US had scored a number of victories over the Japanese however; these defeats did not mean that Japan was on the verge of surrender. Japanese military leaders realized that after the fall of Saipan in July that they could not win the war.³ Nevertheless, they fought with the hope that continued resistance would undermine American will to continue the war and thus possibly secure better terms for the termination of hostilities.⁴ This desire to secure better terms had a direct impact upon the Japanese measures for the defense of the Japanese home island. On 8 June 1945, Emperor Hirohito agreed to the military's call for an all-out resistance to an American invasion in which 100 million Japanese would join in a heroic last stand.⁵

Given Japan's cultural heritage and traditional allegiance to the emperor, it is probable that the Japanese populace would have continued to support the war so long as Hirohito commanded.⁶ Benedict validated this belief in Japanese fanaticism by writing that:

Honor was bound up with fighting to the death. In a hopeless situation a Japanese soldier should kill himself with this last grenade or charge weaponless against the enemy in a mass suicide attack. But he should not surrender. Even if taken prisoner when he was wounded or unconscious, he "could not hold up his head in Japan" again; he was disgraced; he was dead to his former life.⁷

This devotion to the emperor was also inextricably linked to the Japanese belief in the spirit and its power over materialism. According to Benedict:

The spirit was all and was everlasting; material things were necessary, of course, but they were subordinate and fell by the way. . . . This reliance on spirit was taken literally in the routine of war; their war catechisms used the slogan--and it was a traditional one, not made for this war--"To match our training against their

numbers and our flesh against their steel.” Their war manuals began with the bold typeline, “Read this and the war is won.”⁸

Based upon the Japanese devotion to the emperor and the belief in the spirit over material supremacy, the defense of the Japanese home islands would have probably resulted in massive casualties for both sides.

For the Americans the concern was the casualty estimate of an invasion of the home islands. However, while confronted with the grim prospect of yet another invasion, American planners remained committed to a total victory at the lowest possible cost.⁹ The Japanese had never surrendered to a foreign power, and their reaction to such an event was unpredictable.¹⁰ American planners feared that Japanese resistance was to be fanatical and that the Japanese people appeared to be prepared to die in mass for their emperor. This concern over Japanese fanaticism and the mobilization of the Japanese populace for home island defense led one 5th Air Force intelligence officer to declare: “There are no civilians in Japan.”¹¹

In the same statement, this officer went further to state: “We are making war and in making it in the all out fashion which saves American lives, shortens the agony which war is and seeks to bring about enduring peace. We intend to seek and destroy the enemy wherever he or she is in the greatest possible number, in the shortest possible time.”¹² While an individual officer made this statement, the fact that it was published in official USAAF documents and that it was noted in the authorized Army Air Force history of World War II no doubt reflects a prevalent thought resident throughout the USAAF and much of its leadership.

American battle casualties increased as the Pacific war progressed. The average monthly rate of losses quadrupled to nearly 13,000, and the desperate fighting on Okinawa during the spring of 1945 foreshadowed the potential consequences of an invasion of Honshu or Kyushu.¹³ Casualty estimates for the invasion of the home islands of Japan ranged from 31 thousand to 1 million.¹⁴ While the number of casualties estimated for the invasion of the home islands varied greatly and are still in dispute, American planners at the time no doubt believed that it would have been a bloody affair regardless. As a result, the avoidance of generating American casualties was at the forefront of American military concerns.

On 18 June President Truman authorized the use of an invasion over naval blockade to force the surrender of Japan. However, there were those who believed that a blockade combined with the air assault was the best way to force a Japanese surrender. The leading advocate for this position was LeMay, who had contended in April that airpower alone could force the capitulation of Japan within six months before an invasion was to take place.¹⁵

According to LeMay:

Most of us in the Army Air Force had been convinced for a long time that it would be possible to defeat Japan without invading their home islands. We needed to establish bases within reasonable range; then we could bomb and burn them until they quit. That was our theory, and history had proven that we were right. The ground gripping Army, and the Navy, didn't agree. They discounted the whole idea.¹⁶

LeMay went on further to state:

The number of American casualties which would be incurred by an actual invasion of the islands of Kyushu and Honshu was well up in the imaginative brackets and then some. . . . I think we would have won the war anyway, merely by sticking to our incendiary tactics. But we were given the [atomic] bombs and told to go ahead and drop the m.¹⁷

In the USSBS it is further mentioned that: “General LeMay believed that all out air attacks could force Japan to surrender prior to the planned invasion and, at the calculated risk of exhausting all available crews, he committed the command accordingly.”¹⁸

It can be concluded from the above statements that LeMay felt no remorse over the bombing of Japanese civilians because he saw it as a way to avoid American casualties. He expressed similar views regarding the use of nuclear weapons on the Japanese and viewed it as a question of military expediency and not as a moral issue.¹⁹

This desire to avoid American casualties had a direct effect upon the decision to use the atomic bomb and is often suggested as the overlying rationale for its use. However, the desire to avoid American casualties without the use of atomic weapons or an invasion was a popular opinion among those who directed the USAAF bombing campaign in the Pacific.

Arnold, who was visiting the XXIst Bomber Command Headquarters at the time of the 18 June meeting, concurred with the president’s assessment but privately held the conviction, like LeMay, that Japan was already at the brink and could be caused to

completely collapse through the use of airpower alone.²⁰ However, Arnold's official concurrence had strategic implications for the future of an independent air force. His submitted recommendation was placed in order to avoid the potential alienation of Marshall, who advocated the use of ground forces for an invasion, but who was also warming to the idea of an autonomous US Air Force. Arnold did not want to risk the alienation of Marshall in order to secure his endorsement for the future independent air arm.²¹

However, Arnold did believe that an invasion of Kyushu (Operation Olympic) would facilitate the use of the 8th Air Forces' B-17s and B-24s transferring from Europe. Since these airframes lacked the range of the B-29, they could operate from airfields on Kyushu and further contribute to the air effort over Japan. He surmised that the combination of the transferred 8th Air Force assets along with the 20th Air Forces' would then negate the requirement for an invasion of the large island of Honshu (Operation Coronet).²²

According to Lieutenant General Haywood Hansell, General Arnold was quoted at the time as stating:

If we could win the war by bombing, it would be unnecessary for the ground troops to make a landing on the shores of Japan. Personally I was convinced that it could be done. I did not believe that Japan could stand the punishment from the air that Germany had taken.²³

In order to advance this point, Arnold sent LeMay back to Washington to brief the Joint Chiefs, and if they concurred, the president and the Secretary of War. LeMay's

staff with their commander went to Washington to brief the JCS. According to LeMay, Marshall slept through most of the presentation, and LeMay came away convinced that Washington was fully committed to a ground invasion of Japan.²⁴ Regardless of LeMay's failure to change the minds of the Washington leadership, the conduct of the bombing campaign prior to the dropping of the atomic bomb was no doubt influenced by the idea of defeating Japan in an expedient manner that precluded the generation of massive American casualties.

These estimated casualty rates also increased the doubts as to whether the American people had the stamina and will to achieve unconditional surrender.²⁵ Once the war in Europe ended, the leadership in Washington was also concerned over the home front desire to see an "unconditional surrender" occur in the Pacific. Military historian Conrad Crane states that Admiral Ernest King typified the attitude of the JCS when he reportedly stated, "The American people will tire quickly, and that the pressure at home will force a negotiated peace before the Japs are really licked."²⁶ The pressure to bring "the boys" home and relieve domestic shortages was also beginning to increase.²⁷

According to Historian J. Samuel Walker:

Fred M. Vinson, director of the Office of War Mobilization and Reconversion, informed the Joint Chiefs in May 1945 that scarcity of food and clothing, combined with labor strife, caused him to worry about the conversion to a peacetime economy. He said that he was "afraid of unrest in the country" and thought "that the next three to six months would make a vital difference in our future economy." Vinson appealed to the Joint Chiefs to reduce the demands on production, if possible. . . . The problem that Vinson cited placed an additional premium on the need to bring about a Japanese surrender as soon as possible.²⁸

The concern over domestic tranquility and economic prosperity was another impetus for an expedient conclusion of the hostilities. While a direct link between King's

and Vinson's statement and the XXIst Bomber Command operations has not been firmly established, the very ideas they expressed were indicative of the tone and concern officials in the US Government had regarding the public's desire to continue the war.

The moral reservations about the Douhetian bombing conducted by the 20th Air Force remained muted, and on balance they were less influential than the desire to end the war as soon as possible. In the minds of American policy makers, this objective took precedence over moral considerations about the indiscriminate bombing of civilian populations.²⁹

Race and Revenge

In 1944, Hollywood released a motion picture depicting the trial of the captured "Doolittle Raiders" after their B-25s attacked Tokyo in April 1942. The film entitled *The Purple Heart* ended with this statement made by one of the doomed fliers:

It is true we Americans don't know very much about you Japanese, and never did, and now I realize you know even less about us. You can kill us-all of us, or part of us. But if you think that's going to put the fear of God into the United States of America and stop them from sending other fliers to bomb you, you're wrong, dead wrong. They'll blacken your skies and burn your cities to the ground and make you get down on your knees and beg for mercy. This is your war. You wanted it. You asked for it. And now you're going to get it, and it won't be finished until your dirty little empire is wiped off the face of the earth!³⁰

This statement illustrates and represents the American hostility toward the Japanese throughout the war in the Pacific. It was this hostility and sentiment that provided tacit

approval, and some impetus for, the realization of Douhetian bombing in the Pacific theater.

Military theorist Karl von Clausewitz, suggested that war is prosecuted through a “remarkable trinity” that is composed of primordial hatred, the play of chance, and the application of reason. The government provides the reason as war was seen by Clausewitz as an instrument of policy, the army brings chance into play as a commander may have “creative free spirit to roam” in the application of this forces, and the people provide the hatred and enmity required to support a war.³¹ Toward this end, the government establishes the political purpose; the military provides the means for achieving political end; and the people provide the will, the “engine of war.”³²

With this model in mind, the desire to destroy the Japanese empire and bomb its civilian populations at random could not have occurred unless the American population had provided approbation for such acts. The “engine of war,” which provides popular support and desire to prosecute war, was an important ingredient to the American efforts in the Pacific war. The collective American will and desire to inflict as much damage on the Japanese nation as possible allowed for and tacitly approved the USAAF bombing of Japan.

As noted previously, prior to World War II the United States and the president had expressed a distinct distaste for the attacking and killing of civilians from the air. In 1940, Roosevelt went on to “recall with great pride that the United States consistently has taken the lead in urging that this inhuman practice be prohibited.”³³ While USAAF planners were no doubt sensitive to the morality of bombing civilian populations, in the

spring of 1945 American protest to the of Japanese cities never materialized, and raids were to continue with abandon.

This lack of revulsion and little public outcry over the nature of the bombing campaign in the Pacific is directly attributed to racial motivations and overt hatred of the Japanese. This overt hatred had been growing in America for one-half of a century and was exacerbated by the Japanese invasion of China and the “rape of Nanking” in 1937.³⁴ Pearl Harbor crystallized this hatred and since that time, the Japanese had continued to overtly flaunt their atrocities and criminal activities on the world stage, thus furthering anti-Japanese sentiment.³⁵ The mistreatment of Allied prisoners; the widespread execution, rape, and random killing of Chinese men and women; forced labor and institutionalized murder; combined with a host of other Japanese victories all help to create fervent anti-Japanese sentiment. This sentiment provided the will and approval for the fire bombing of Japan.

This anti-Japanese sentiment was resident in official speeches, publications, and government documents. In much of the official correspondence of the USAAF at the time, the term “Jap” is widely used and accepted while congratulatory verbiage is used prolifically in applauding LeMay’s fire bombing efforts. President Roosevelt too used the words “uncivilized,” “inhuman,” “depraved,” and “barbarous,” when describing Japanese actions.³⁶ While Admiral William Halsey, Commander of the South Pacific Fleet, rallied his men under such slogans as “Kill Japs, Kill Japs, Kill more Japs.”³⁷

In July 1945, Major General Claire Chennault, commander of the famed “Flying Tigers” and subsequently the 14th Air Force, sent a letter to LeMay suggesting that the strategic bombing effort include the deliberate poisoning of the Japanese rice crop with

fuel oil. Chennault estimated that this effort could kill 20 percent of Japan's rice crop and "millions of Japanese [would] face starvation."³⁸ While LeMay ignored the suggestion, malevolent overtones included in such a suggestion cannot be ignored and are indicative of the hate harbored by American leaders.

Historian John Dower noted, "That knowledgeable observers who followed American attitudes at the levels where opinions were shaped and policies made certainly concluded that support for an annihilationist policy against the Japanese was extremely strong."³⁹ This anti-Japanese rhetoric and annihilationist sentiment was due in large part to the crudely racist nature of the American response to Pearl Harbor and was further fueled by the continued reports of Japanese atrocities.⁴⁰

In regards to the use of airpower, Dower noted that air raids were widely accepted as retribution and as sound strategic policy, and raised few arguments.⁴¹ When Tokyo was bombed and incinerated, there was scarcely a protest on the American home front.⁴² To many, the burning of cities, such as Tokyo, Osaka, Nagoya, and Yokohama was "just desserts" for the Japanese people. For the Americans, Japan was now reaping what it had sowed.⁴³

For Arnold the evidence of Japanese military brutality proved to him that a line had been crossed between moral and amoral behavior and it justified to him the kind of warfare the 20th Air Force was executing.⁴⁴ General Spaatz had remarked that he did not hear of any complaints after the war from the American public concerning the mass bombing of Japan.⁴⁵ Thus the USAAF leadership has assumed correctly that the vast majority of their countrymen approved of the desire for revenge.⁴⁶ California State University Professor Michael Schaffer notes that in the minds of the USAAF leadership,

the moral attitudes were weighed against American public opinion favoring harsh treatment of the Japanese, and public opinion was the victor.⁴⁷

In concert with official disdain for the Japanese, a significant portion of American public opinion approved of the extermination of the Japanese people or at least the country's "thoroughgoing defeat."⁴⁸ Public opinion polls reflected that 10 to 13 percent of Americans supported the "annihilation" or "extermination" of the Japanese as a people, while similar numbers were in support of severe retribution after Japan had been defeated.⁴⁹ In a 1944 poll asking "What do you think we should do with Japan as a country after the war?" 13 percent of Americans surveyed wanted to "kill all Japanese," and 33 percent were in favor of destroying Japan as a political state.⁵⁰ Another survey conducted by *Fortune* magazine in December 1945 found that 22.7 percent of those polled had wished the United States had used more atomic bombs before Japan had surrendered.⁵¹

This same type of sentiment was reflected in the American popular media and press. *Time*, *Newsweek*, *Life*, and *Reader's Digest* magazines freely used the term "Jap."⁵² An American scientific periodical featured a story "Why Americans Hate Japs More than Nazis," thus assuming this was the case without first demonstrating that the premise was indeed fact.⁵³ The Marine Corps monthly magazine *Leatherneck* even ran headlines reminiscent of the nineteenth century American Indian Wars stating: "Good Japs are Dead Japs."⁵⁴ Furthermore, a 1943 best seller *Singapore is Silent* also insinuated that a war with Japan would continue, "until not only the body but the soul . . . is annihilated, until the land . . . is plowed with salt, its men dead, women and children divided and lost among other people."⁵⁵

Songs of the time also represented this harbored hatred of the Japanese. Tunes, such as “You’re a Sap, Mr. Jap,” “Take a Rap at the Jap,” and “We’re Gonna Have to Slap the Dirty Little Jap,” along with many others were popular with the American public and indicative of the national sentiment.⁵⁶

All of the official and popular anti-Japanese rhetoric was further fuel by the common depiction of the Japanese as less than human or subhuman.⁵⁷ Racial stereotypes and animosities were key psychological tenets to the American war effort as the Japanese were normally depicted as monkeys, reptiles, insects, and vermin.⁵⁸ Figure 8 is but one example of this depiction. (Note especially the last phrase in figure 8: “breeding grounds around Tokyo must be completely annihilated.”) Racially charged comments, such as “yellow rats,” “yellow monkeys,” and “yellow bastards,” further demonstrated American popular sentiment.⁵⁹

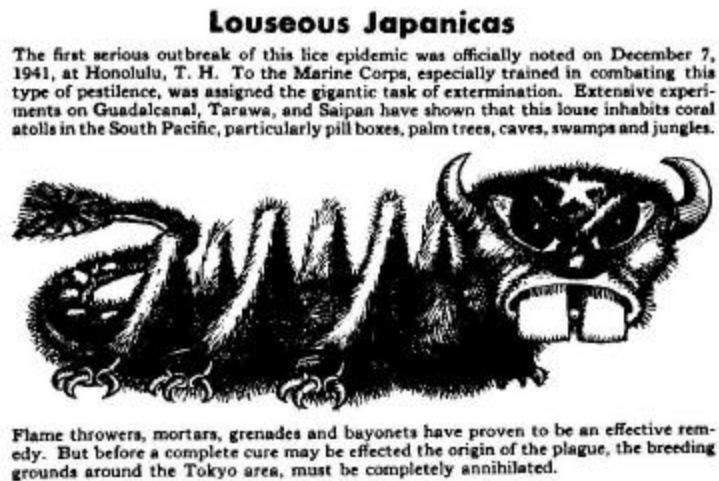


Figure 8. Excerpt from *Leatherneck* Magazine, March 1945. Source:

Leatherneck, March 1945; 37.

According to Dower:

At the simplest level, they (the animal depictions) dehumanized the Japanese and enlarged the chasm between “us” and “them” to the point where it was perceived to be virtually unbridgeable. . . . The enemy in Europe “were still people.” The Japanese were not, and in good part they were not because they were denied even the ordinary vocabularies of “being human.”⁶⁰

Both the official anti-Japanese sentiment and the popular American cultural tones provided the “engine of war” for the Pacific theater. While motivated by both anger and outrage over Japanese actions in the Pacific, racial overtones were also prevalent. All of these factors created an environment that allowed for the transition to incendiary bombing and provided the USAAF carte blanche authority to conduct whatever practices it deemed necessary. This authority provided LeMay and the USAAF unprecedented license to destroy an enemy that was viewed as less than human and unworthy of existence in the civilized world.

Arnold’s and LeMay’s Agendas

Perhaps no other individual could be credited more with the creation of the modern United States Air Force than General Arnold. His drive and vision for the establishment of an independent US air arm in 1947 was a significant factor in the designation of this fourth branch of America’s armed services. However, this significant

achievement did come at a price, and part of that price was to be paid by the citizens of Imperial Japan in 1945.

As noted in chapter 2, for Arnold the desire to validate the strategic bombing concept and airpower as a viable tool for the subjugation of an enemy was an overriding imperative for the USAAF. There was no doubt that Arnold's main goal was to have the USAAF contribute to winning the war to the largest extent possible while ensuring that the Air Force received its due credit.⁶¹ For Arnold, ambition for himself and the USAAF, between which he often could not distinguish, was his guiding star.⁶²

From his position in Washington, Arnold wielded great personal authority over a service that was stretched worldwide. While never having a combat command himself, Arnold harassed subordinates that did not understand his intentions nor did he tolerate impediments to success that often faced his bomber commanders.⁶³ In late 1944, when the XXIst Bomber Command was not producing the results he expected with the B-29, Arnold sacked the commanding officer, Major General Hansell (who had been a key figure in the development of AWPD-1 and 42) and replaced him with Major General Curtis LeMay. This replacement came on the heels of the relief of another commander, Brigadier General K. B. Wolfe from the XXth Bomber Command in the CBI theater. This ability to replace commanders who were not producing up to the standards Arnold required sent reverberations throughout the USAAF.

Arnold's desire to secure the future of the Air Force was tied directly to the success of the bombing campaigns and especially the B-29. As discussed in chapter 4, it was Arnold who took the chances, cut the corners, and ordered an airplane into production before the prototype was even built.⁶⁴ This was an unprecedented risk with

huge implications. Because of the risks he took with the B-29 project and the concerns he had regarding it, Arnold personally selected the commanders for each B-29 bomb group.⁶⁵

This desire to ensure the success of the B-29 went even further as it resulted in his personal oversight of B-29 operations. The 20th Air Force was created in April 1944 and functioned directly under the JCS (table 2). The headquarters was established in Washington, D.C., with Arnold in command, and when the B-29s were sent to the Pacific and CBI theaters, they fell under his direct control.⁶⁶

Arnold retained control believing that placing the B-29 under a theater commander was a mistake. A potential theater commander would be tempted to divert the strategic bomber from its intended purpose and use it for tactical missions.⁶⁷ Neither Nimitz, MacArthur, nor Stilwell were strong advocates of strategic airpower, and the lack of unity of command in the Pacific theater caused Arnold to retain control in order to ensure the strategic use of the B-29.⁶⁸ This fear over the misuse of the Superfortress was further validated when the Navy requested B-29s to conduct antisubmarine duties.⁶⁹ Thus, Arnold's retention of B-29 operations was intended to ensure that the weapon system was used to conduct the types of missions for which it was designed.

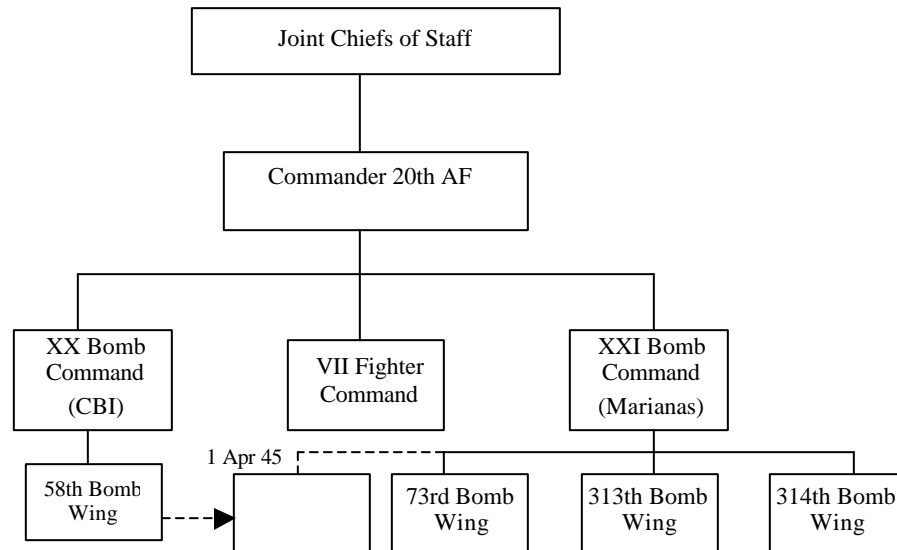


Figure 9. 20th Air Force Organization Chart as of 1 March 45. Source: United States Strategic Bombing Survey, *The Strategic Air Operation of the Heavy Bombardment in the War Against Japan, Final Report*, 2-3.

Furthermore, Arnold saw the B-29 and its mission as its own theater of war. Toward this end, even the name of the 20th reflected this significance. With fifteen air forces in place, the next number for the new air force should have been sixteen. However, Arnold himself decided to call the new air force the 20th because he saw the strategic bombing of Japan as a separate endeavor in the war, and the obtuse numerical designation helped to illustrate this fact.⁷⁰

When displeased with the initial results of B-29 operations and having removed Hansell, Arnold turned to one of the commanders he considered to be a rising star—LeMay. Arnold saw LeMay as a no-nonsense commander who got results. Arnold placed great trust in LeMay. It was LeMay who had helped to pioneer bombing operations over Germany, and his skill as an air leader and allegiance to tough and constant training had provided dividends for units he had commanded. Arnold, in his

desire to validate both the B-29 and airpower, turned to LeMay to improve bombing operations in the Pacific just as he had done in Europe.⁷¹ It was LeMay who Arnold hoped would provide the catalyst for the successful application of B-29 capabilities.

In a March 1945 letter from Arnold to his subordinate, the Air Force Chief of Staff wrote; “Under reasonably favorable conditions you should then have the ability to destroy whole industrial cities should that be required.”⁷² This ability to destroy whole cities, combined with Arnold’s desire for results and LeMay’s pragmatic leadership, helped set the stage for the widespread destruction of Japanese infrastructure.

For LeMay, the B-29 and the capabilities it possessed created a unique opportunity in the annals of war. LeMay summed up his attitude in a message to Brigadier General Lauris Norstad, Chief of Staff for the 20th Air Force:

I am influenced by the convictions that the present stage of development of the air war against Japan presents the AAF for the first time with the opportunity of proving the power of the strategic air arm. I consider that for the first time strategic air bombardment faces a situation in which its strength is proportionate to the magnitude of its task. I feel that the destruction of Japan’s ability to wage war lies within the capability of this command, provided its maximum capacity is exerted unstintingly during the next six months, which is considered to be the critical period. Though naturally reluctant to drive my force at an exorbitant rate, I believe that the opportunity now at hand warrants extraordinary measures on the part of all sharing it.⁷³

LeMay himself best describes his relationship with Arnold in light of the B-29:

General Arnold, fully committed to the B-29 program all along, had crawled out on a dozen limbs about a thousand times, in order to achieve the physical resources and sufficient funds to built those airplanes and get them into combat. . . . So he finds that they're not doing well. He has to keep juggling missions and plans and people until the B-29's do well. General Arnold was absolutely determined to get results out of this weapon system. The turkey is around my neck. I've got to deliver.⁷⁴

Despite the fact that LeMay had initially used the same tactics that were employed by Hansell, the desire to achieve significant results with the B-29 created yet another impetus for a change in strategic bombing practices. In the final analysis, LeMay's ability to turn from established procedures, once they proved to be ineffective, and try a new approach was a key aspect to his success.⁷⁵ This ability of LeMay not only served Arnold well in his desires, but also got the most effective use out of the B-29 while creating favorable conditions for the surrender of Japan.

Summary

War is a human endeavor and is conducted through the passions, hatred, and irrationality that are human emotion. These human characteristics, combined with analytical and systemic reasoning, facilitated and probably expedited the transition to low-level area bombing. The desire to end the war quickly without a land invasion, racism toward and hatred of the Japanese people, combined with various human agendas were all variables that affected USAAF operations.

While these human variables were conventional, advances in science and technology now made it possible to employ exterminationist practices that were unconventional.⁷⁶ Toward this end, racism, dehumanization, and hatred combined with

technological advances became inextricably linked to cause the kind of widespread carnage experienced by the Japanese empire in the spring of 1945. This marriage of technology and human nature made it possible for the first time to deliberately annihilate an entire race of people in a relatively short period of time. This same recipe for conflagration and disaster was developed further when nuclear and thermonuclear weapons made their appearance on the world stage.

¹Ruth Benedict, *The Chrysanthemum and the Sword* (Boston, MA: Houghton Mifflin, 1946), 1.

²J. Samuel Walker, *Prompt and Utter Destruction* (Chapel Hill, NC: University of North Carolina Press, 1997), 9.

³Ibid., 30.

⁴Ibid.

⁵Ibid., 31.

⁶Craven and Cate, 5:756.

⁷Benedict, 38.

⁸Ibid., 23-24.

⁹Walker, 34.

¹⁰Crane, 136.

¹¹Craven and Cate, 5: 696-697.

¹²Ibid.

¹³Crane, 136.

¹⁴Walker, 39.

¹⁵Ibid.

- ¹⁶LeMay and Cantor, *Mission With LeMay*, 381.
- ¹⁷Ibid.
- ¹⁸USSBS, *The Strategic Air Operation of the Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 13.
- ¹⁹LeMay and Cantor, *Mission With LeMay*, 381.
- ²⁰Hansell, *The Strategic Air War Against Germany and Japan*, 251.
- ²¹Ibid.
- ²²Ibid.
- ²³Ibid., 252.
- ²⁴Crane, 137.
- ²⁵Ibid.
- ²⁶Ibid., 122.
- ²⁷Walker, 41.
- ²⁸Ibid.
- ²⁹Ibid., 96.
- ³⁰John Dower, *War Without Mercy* (New York, NY: Random House, 1986), 50.
- ³¹Karl von Clausewitz, *On War* (Baltimore, MD: Penguin, 1968), 119, 121, 123.
- ³²LTC S. D. Serafini, Officer Basic Course memorandum, *Clausewitz Condensed*, CRS-3, US Army Training and Doctrine Command, 15 February 1985, author's collection.
- ³³Dower, 40.
- ³⁴Schaffer, 155.
- ³⁵Ibid., 42.
- ³⁶Ibid., 49.

³⁷Ibid., 36.

³⁸C. Chennault correspondence to C. LeMay, 9 July 1945, Box 11, LeMay Papers, Library of Congress.

³⁹Dower, 36.

⁴⁰Ibid., 37.

⁴¹Ibid., 41.

⁴²Ibid.

⁴³Ibid.

⁴⁴Schaffer, 154.

⁴⁵Ibid.

⁴⁶Ibid.

⁴⁷Ibid., 176.

⁴⁸Dower, 55.

⁴⁹Ibid., 53.

⁵⁰Ibid., 53-54.

⁵¹Ibid.

⁵²Ibid.

⁵³Ibid., 78-81.

⁵⁴Ibid.

⁵⁵Dower, 54; and G. Weller, *Singapore is Silent* (New York, NY: Harcourt, Brace and Company, 1943), 5.

⁵⁶Dower, 81.

⁵⁷Ibid.

⁵⁸Walker, 21.

⁵⁹Ibid., 22.

⁶⁰Dower, 82.

⁶¹Crane, 33.

⁶²Sherry, 182.

⁶³Ibid, 181.

⁶⁴LeMay, *Superfortress*, 23.

⁶⁵Morrison, 63.

⁶⁶USSBS, *The Strategic Air Operation of the Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 2-3.

⁶⁷LeMay, *Superfortress*, 55.

⁶⁸Morrison., 73.

⁶⁹Ibid., 38.

⁷⁰LeMay, *Superfortress*, 55.

⁷¹Morrison, 207.

⁷²H. Arnold correspondence to C. LeMay, 21 March 1945, Box 11, LeMay Papers, Library of Congress.

⁷³Craven and Cate, 5: 627.

⁷⁴LeMay and Cantor, *Mission With LeMay*, 338; and Morrison, 207.

⁷⁵Morrison, 217.

⁷⁶Dower, 93.

CHAPTER 6

CONCLUSIONS

On 9 August 1945 Major Charles Sweeney was an aircraft commander in charge of his first combat mission. In the bomb bay of his B-29, named *Bocks Car*, was the second nuclear weapon dropped upon the Japanese nation. Called “Fat Man,” the bomb was composed of 5,300 pounds of composition B and Baratol laid out in a precise configuration around an eleven-pound sphere of plutonium.¹ Even without the plutonium sphere, the quantity of composition B and Baratol explosives alone made the bomb the most powerful in the Pacific theater.² While weather precluded Sweeney from dropping the bomb on his primary target, he was able to locate his secondary one-Nagasaki. At 1102 Fat Man was released from its bomb shackles and detonated a few minutes later killing between 35,000 to 40,000 and injuring a similar number.³

Not only did this bomb signify an apex of American technological achievement at the time, but combined with the nuclear bombing of Hiroshima, it also represented the ultimate application of area bombing. Fat Man, in conjunction with “Little Boy,” the bomb dropped on Hiroshima, resulted in the destruction of over 6.2 square miles of urban structure, killed over 105,000 people, and caused roughly the same amount to be injured.⁴

The magnitude of the damage and casualties caused by these two bombs is set in relief by a comparison with the Tokyo fire raids of 9-10 March when sixteen square miles were destroyed and the number of injuries were similar.⁵ The difference was that only two aircraft conducted the nuclear attacks, each armed with only one bomb, while the March raid was conducted by hundreds of aircraft loaded full of incendiary bombs.

While already possessing the ability and desire to create massive civilian casualties, the prerequisites for the dropping of nuclear devices were already firmly established. The rationales and reasons that supported the effort also created an environment that allowed for the use of atomic weapons. General LeMay, the 20th Air Force, the USAAF, the US government, and the American people all provided the collective means to cause the kind of destruction created from these two relatively small, yet powerful bombs.

The Synergy of Factors

The destruction caused by the strategic bombing campaign was tabulated through damage assessments conducted after the war. In this effort the USSBS determined that the raids of the 20th Air Force destroyed over 170 square miles of Japan's urban industrial area and over 550 industrial installations engaged in war-making production.⁶ Approximately 2.3 million homes were destroyed, 330,000 to 990,000 civilians were killed, and the injured were estimated between 475,000 to 1.3 million.⁷ Additionally, 8.5 million civilians were left homeless, and 21 million were subsequently displaced.⁸ At no time before, or since, has such destruction been levied upon a population in such a relatively short period of time. Through the synergy of a number of factors, the transition of USAAF bombing practices came about yielding the kind of grim numbers listed above.

First, the unique geographical location of Japan and its accompanying meteorological conditions precluded the use of high-altitude precision bombing. From the beginnings of the strategic effort in the Pacific, weather continuously prevented the type of bombing the USAAF had claimed in its doctrine. High winds were experienced

both enroute and over the target area that not only reduced bombing accuracy but also affected the B-29s range, speed, and endurance. Bombs were easily blown off course, as could the planes themselves. Often the B-29s had difficulty holding a steady position during their bombing runs and therefore could not provide the stable platform required for precision bombardment. These first experiences with the jet stream and with high-speed winds aloft made conventional precision bombing not only an impossibility, but also stressed both man and machine to their limits.

Additionally, continuous cloud cover around and over the Japanese islands also prevented precision strikes from taking place. While the Norden bombsight was a capable machine, the accuracy of it was rendered moot if the bombardier could not locate his target through the sight's reticle. Japanese weather patterns always included large amounts of cloud coverage that frustrated USAAF aircrews trying to locate their targets visually. Despite the advent of airborne radar and its refinement as the war progressed, the inability of US aircrews to visually locate their targets through layers of clouds also contributed to the transition of USAAF bombing practices. While radar was becoming more and more capable, this 1940's technology still had its limitations and could not provide the definition necessary to carry out the type of bombing prescribed by the USAAF.

Secondly, these factors of nature, combined with man-made features, such as the design and composition of Japanese cities and production methods, further complicated the application of prewar USAAF bombing practices. Because the Japanese had spread out most of its manufacturing base, striking large factories only destroyed part of the industrial process. Smaller feeder factories that created vital parts were equally relevant

targets and were often located in urban areas some distance from their larger counterparts.

Additionally, the Japanese had used home industry for a time and USAAF planners concluded that this practice was still key to the Japanese production system and decided that these homes were also relevant targets. Despite the fact that home production had ceased to be a factor by 1944, Japanese homes were still considered worthy targets during the bombing campaign.

Since Japanese manufacturing and infrastructure was such a widespread affair, American war planners deduced that the wood and paper houses of Asian cities could be used as fuel for creating conflagrations helping to destroy not only enemy morale but the enemy's dispersed industry base. As a result, 70 percent of the ordinance dropped during the bombing effort was incendiary munitions while the reminder was composed of HE and aerial sea mines. This use of incendiaries combined with the tinderbox of Japanese cities helped to create scenarios that were similar to those first described by Douhet in 1916.

Thirdly, the capabilities and deficiencies of the B-29 also contributed to the transition of bombing practices. The B-29 was the most technologically advanced aircraft of its day. It could carry more bombs higher, further, and faster than any of its predecessors. However, for such a capable airframe, it had its deficiencies and limitations. Design problems with the airframe required a change to bombing mission profiles that in turn had a significant impact upon strategic bombing practices and its effects.

Because of a number of engineering and maintenance factors, B-29s were required to fly at much lower altitudes than had originally been planned. As a result of flying at lower altitudes, B-29s required less maintenance and aircraft availability rose appreciably. Also, the flying at lower altitudes provided a further benefit of increased bomb loads. As a result, more B-29s flying, coupled with the larger bomb loads, eventually lead to more tonnage being dropped on Japanese cities thereby creating more damage. Despite the prewar doctrine of the USAAF, mass, in both aircraft and in bombs, was now becoming a tenet of US airpower.

Fourth, add in human nature and a desire to inflict as much damage as possible on an enemy that was perceived as subhuman, and the result was the kind of destruction inflicted upon the malevolent Japanese Empire. Americans had come to loath the Japanese and with the catalyst that was Pearl Harbor, inflicting as much pain as possible on the Japanese became a national obsession. Both US Government officials and American popular culture expressed a hatred of Japan and the extermination of the Japanese was an idea that was regarded by some as desirable. This hatred of Japan provided a national mandate for the type of destruction conducted by the USAAF and gave license to any field commander in the Pacific theater.

Included too, the national desire to avoid large amounts of American casualties and hopefully end the war without a land invasion. Americans were already becoming war weary and the idea of a protracted conflict had both economic and moral implications for the US. There were fears of severe manpower and material shortages by 1946 if the war was not yet concluded. Additionally, there was also a concern about the American people's desire to see through to an unconditional surrender of Japan. Many US leaders

feared that Americans would be unwilling to pay the price for a Japanese surrender if the invasion of the home islands became as deadly as projected. As a result, getting the war over with, transitioning to a peacetime economy, and the sparing of American lives was a concern for many in the US government. These concerns were no doubt recognized by leaders of the War Department and by many military commanders.

In an effort to conclude the hostilities quickly, many American planners tried to see to the capitulation of the Japanese Empire through the use of airpower alone. Most of these were USAAF personnel who thought this use of airpower could also validate the USAAF's role in the war effort. This use of airpower and its validation was paramount to the desires of Generals Arnold and LeMay. Toward this end, the USAAF leadership believed the massive destruction of infrastructure and production capabilities on the Japanese island would expedite the end of the war. These men had built and staked their reputations on the ability of airpower to be decisive in war and spared no energy in this effort.

While Arnold had taken a number of risks in developing the B-29, he needed the likes of LeMay to implement the weapon effectively. Arnold's gamble on an unproved design and the money spent developing it was a constant source of concern for the Chief of the USAAF. This concern was conveyed to LeMay who sought the most effective application of the B-29 in order to validate the expenditure of resources on this airframe. LeMay's innovation, encouraged through his subordination to Arnold, not only saw to the success of the B-29 but also expedited the transition to area and fire bombardment by the USAAF.

By themselves, none of the above-described factors could have led to the kind of devastation seen by the Japanese on their home islands in 1945. No single rationale could have caused nor created the impetus for the area bombing of Japanese cities. However, the collective effects of these factors and the synergy provided by their combination produced the kind of destruction experienced by the Japanese nation. It was the cumulative effects of the man-made and natural factors, combined with the human element that facilitated, and resulted in, the transition of USAAF bombing practices.

Theoretical Implications

A review of the Pacific campaign requires a discussion over the bombing applications first proffered by Douhet. Since Douhet envisioned the deliberate targeting of civilians and cities while creating a demoralizing effect, did the USAAF efforts validate the Italian's ideas regarding the use of terror as a weapon? Were the bombing campaigns in both theaters effective strategic endeavors or were they merely a way to inflict pain on a loathed and demonized enemy?

These questions require much study and review. However, it could be concluded from modern strategic applications of airpower, Desert Shield and Desert Storm, the Kosovo Campaign, and Operation Enduring Freedom, that the selective strategic precision targeting of an enemy's infrastructure can be effective in order to undermine war-making efforts. The difference now is that technology allows for the precision-strike capabilities first promoted by ACTS.

What took an entire B-29 bomb wing to do in 1944 can now be accomplished with a single B-1. In order to create the type of effects World War II planners wanted, hundreds of tons of bombs needed to be dropped in a given area. Now those same effects

can be achieved with a single laser or GPS-guided munitions while keeping collateral damage to a minimum. Chinese embassies and Iraqi bomb shelters aside, modern methods of strategic bombing can produce the second and third order effects desired without the need of area bombardment.

Toward this end, technology has only recently caught up with the theory. While the term “precision” has relative meaning from era to era, only now can we perform the kind of bombing ACTS doctrine envisioned. During the Pacific bombing campaign, a target area was closely equivalent to a circle with a radius of 1,490 feet.⁹ In order to destroy a power plant or aircraft factory, the USAAF needed hundreds of bombers to strike an area thousands of feet wide. Today the USAF can now do it effectively with one or two Mk-84s instead of hundreds of M69s. Effects based targeting has supplanted the geographically centered notion of precision bombardment.

It should be noted that mass is still an important part of the application, not in terms of firepower or necessarily in destruction, but in terms of effects. Effects-based targeting is key to the success of an aerial campaign. Strategic bombardment can be more precise today in the application of firepower but still needs to produce effects that cause reverberations throughout the enemy nation. Without sufficient force at the correct and relevant targets, an aerial campaign can unravel into a series of meaningless and wasteful use of resources. German efforts in the Battle of Britain and American strategic air operations prior to Linebacker II in Vietnam are but two examples of wasteful attacks.

However, as mentioned in chapter 3, JCS directive 742/12 called for the deliberate “undermining of Japanese morale.” Toward this end, terror bombing became American policy despite its prewar doctrine. According to the USSBS, in this endeavor,

the USAAF was largely successful in “striking a serious blow to Japanese morale.”¹⁰

The combination of the sea blockade, Japanese war weariness, and strategic bombardment all contributed to a defeatist attitude that became prevalent in the Japanese empire by summer 1945.

While the USSBS concluded that Japanese morale had been adversely affected by the bombing campaign and accomplished part of JCS directive, a key element is missing. What is the measurement of morale and how is it determined? What metric is to be used in order to determine when a nation’s morale is beginning to falter or wane? It may be ascertained after the conflict is over with interviews and demographic surveys, but how can it be done during the conduct of military operations? How can it be measured during the conflict to make this information useful to the operational and strategic level commander? This was a question to which American leaders in 1945 did not yet have an answer.

It could be concluded that Douhet was correct in his assumption that enemy morale can be broken through the use of airpower, assuming it is applied effectively. This effect has the potential to undermine national will and effort. However, while the methods of strategic bombardment have changed, enemy morale is still proving to be an effective target. The question that still remains is: How do commanders ascertain the effects of this targeting in order to shape subsequent military operations? How does a commander determine the enemy’s emotional breaking point in order to take advantage of it? For these questions, there is still no answer.

Toward this end, Douhet’s ideas still have merit and his theory is still relevant, but they continue to leave air planners with no measure of effectiveness. The

psychological and morale effects that he was promoting are intangible and ambiguous and are therefore difficult to harness and include as part of an operational war plan. No metric exists to measure human will and determination. Therefore, Douhetian tactics, while effective in many cases, leave the operational planner with no guideline for a definitive end state. That in itself is problematic.

Legacy

It should be noted that conflict, regardless of era, brings about changes in tactics, techniques, and procedures. Armies habitually start conflicts with the tactics that were used in the last war or ones that were developed during interwar periods and then change these applications as the new struggle unfolds. This phenomenon is not exclusive to the USAAF or to late 20th century militaries.

Armies of World War I did not begin that conflict with an appreciation of longer range artillery, the advent of tanks, and widespread use of machine guns, but eventually morphed their applications to include the use of such weapons. The American Civil War too, saw a change in battlefield applications as the rifle, telegraph, and railroads established their importance to the armies clad in both blue and gray. And in 1631 at the battle of Breitenfeld, Gustavus Adolphus shocked the armies of the Catholic League by attaching musketeer companies to Swedish cavalry squadrons thereby routing caracole charges that had become the custom of the day.¹¹

These are only a few examples of how military applications change as a result of battlefield experience. The American strategic bombing campaigns were no different. As these bombing efforts were conducted, air commanders realized that the methods previously subscribed to were not effective or relevant to the World War II air battle.

Innovation and tactical necessity overrode both doctrinal priorities and moral considerations. Just like the historic examples cited, leaders of the USAAF changed their tactics in order to make the most effective use of the resources available. This is a legacy that did not begin with the USAAF but one that will continue throughout the history of armed conflict.

Along this same vein, another legacy of the Pacific strategic bombing campaign has not so much to do with the Japanese home islands as it does with the world as a whole. The bombing campaign helped to lay the intellectual and technological foundations for the development of other mass-bombing practices. A few years after the nuclear detonations over Japan, thermonuclear weapons became a reality. Subsequent to that, missile technology matured and the amount of devastation and the ranges at which it could be delivered had grown geometrically.

In conjunction with these means came the will to use them. Ideas, such as Mutually Assured Destruction, brinkmanship, and nuclear deterrence, all became acceptable notions of defensive practices and policies. Towards this end, the reverberations of the Pacific strategic bombing campaign could be felt long after the last bombs were dropped on the Japanese home islands.

Civil defense drills, backyard bomb shelters, and the concern over nuclear exchanges conditioned entire populations that massive civilian casualties were to become a normal by-product of war. To an extent it could be concluded that the Pacific bombing effort initiated this conditioning and convinced not only the USAAF (and later USAF) leadership, but also the world, that massive civilian casualties on an enlarged scale were now a normal part of the conduct of war.

However, America was to learn in subsequent conflicts that the threat of draconian nuclear applications had their limitations. While the world has since been spared nuclear holocaust, the specter of nuclear winters and worldwide conflagrations has never left the global psyche and still remains a part of the modern human condition. The foundations for such concerns can be found to a certain degree in the CBO in Europe, but to a much greater degree in the Pacific. The transitions in bombing applications that came about in these two theaters had ramifications that went far beyond the enemies' borders. These effects have lasted decades and will remain with us for the foreseeable future

¹Charles Sweeney, *War's End* (New York, NY: Avon Books, 1997), 2.

²*Ibid.*

³USSBS, *The Effects of Atomic Bombs on Hiroshima and Nagasaki* (Washington, DC: United States Government Printing Office, 1946), 3-5.

⁴*Ibid.*

⁵*Ibid.*, 4.

⁶USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 30.

⁷ Schaffer, 148.

⁸Morrison, 296.

⁹Hansell, *The Strategic Bombing Campaign Against Germany and Japan*, 224.

¹⁰USSBS, *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force) Final Report*, 15.

¹¹Scott Stephenson, "Breitenfeld: A Battle Piece" in *Combat Studies Institute C600 Term I Syllabus/Book of Readings* (Ft Leavenworth: KS, US Army Command and General Staff College, 2001), 45.

GLOSSARY

8th Air Force: One of two numbered air forces that conducted strategic bombing against Nazi Germany in the ETO. Pioneered United States strategic bombing theory and its application.

20th Air Force: The organization that conducted the strategic bombing campaign against the Japanese. Commanded by General H. H. Arnold, it was composed of the XXth Bomber Command in the CBI theater and the XXIst Bomber Command in the Marianas.

Area Bombing: The practice of bombing a portion of or an entire city in order to destroy it or dislocate inhabitants. Area bombing may or may not include the three most important objectives in a bombing campaign: war industries, rail lines, and troops in the field.

Air War Planning Documents (AWPDs): War plans written by the USAAF's Air War Plans Division in order to design the American air war effort. AWPDP-1, which was superseded by AWPDP-42, served as the blueprint for the creation of the Army Air Forces and the conduct of the air war.

General H. H. Arnold: Chief of Staff for the United States Army Air Forces during World War II and the Commanding General of the 20th Air Force. A proponent of strategic bombing, the B-29, and an independent United States Air Force.

B-29 Superfortress: The primary aircraft utilized to conduct the bombing campaign against the Japanese home islands. The B-29 was the only aircraft capable of reaching the Japanese home island from the American bases on Tinian and Guam. It featured a pressurized cabin, highly advanced remote control firing system, and a bomb capacity of 20,000 lbs.

Douhetian Tactics: See Morale bombing.

Fire Bombing: The practice of dropping incendiary as opposed to high explosive bombs in order to create conflagrations on the ground that would result in mass destruction through fire.

General Curtis E. LeMay: Commanding officer of XXIst Bomber Command during the firebombing campaign in the Pacific. Developed the application of low-level area incendiary bombardment of Japan. Went on to command the Strategic Air Command and eventually served as the Chief of Staff of the United States Air Force.

Operation Coronet: The planned US invasion of the Japanese home island of Kyushu. The end of the war precluded the operation. Expected to be a bloody and casualty intensive operation.

Operation Olympic: The planned U.S. invasion of the Japanese home island of Honshu. Intended to be a subsequent operation to Operation CORONET. However, the end of the war precluded the invasions. It too was expected to be a manpower and casualty intensive operation against a fanatical Japanese defense.

Morale/Terror Bombing: The deliberate targeting of civilian populations of an enemy nation in order to influence their willingness to fight while simultaneously generating civilian casualties. This targeting of the population was designed to encourage the enemy's civilians to influence their government to end the hostilities. Referred to in the thesis as "Douhetian Tactics."

R-3350: The engine used by the B-29 Superfortress. Initially fraught with design problems that partially precluded effective use of the B-29 at high altitude. As a result bombing altitudes were lowered to facilitate the engine life and performance capabilities of the airframe.

Precision Bombing: A method of targeting an enemy's war making capacity by selectively attacking centers of production and associated infrastructure. Target areas designated under the heading of precision bombing were regarded as having a radius of 1000 ft around the aiming point of impact.

War Plan Orange: The American war plan that outlined U.S. strategy in the event of war with Japan. Created during the inter-war years, this plan set forth American strategy for an upcoming Pacific war. Presumed that a Pacific war would begin with a surprise offensive by Japan and envisioned the isolation of Japan as a precursor to victory.

XXth Bomber Command: One of two subordinate commands of the 20th Air Force. Conducted strategic bombing against the Japanese from the CBI theater. Was eventually withdrawn and had its operational assets transferred to the XXIst Bomber Command in the Marianas.

XXIst Bomber Command: The second of two subordinate commands under the 20th Air Force. Conducted the majority of the bombing on the Japanese homeland during the war. It was commanded by Brigadier General Haywood Hansell, who was relieved of command, and replaced by Major General Curtis E. LeMay in January 1945.

United States Army Air Force (USAAF): Predecessor to the modern United States Air Force. The part of the United States Army that conducted the air operations during World War II. Was previously known as the Army Air Corps.

United States Strategic Bombing Survey (USSBS): An in-depth study conducted after the war to evaluate the effects of the Allied strategic bombing efforts against the Axis nations. Provided detailed analysis of bomb damage and its effects upon Axis industrial production and war-making capabilities as well as the impact upon enemy populations.

BIBLIOGRAPHY

Published References

- Arnold, H. H., and I. Eaker. *Winged Warfare*. New York, NY: Harper, 1941.
- Benedict, Ruth. *The Chrysanthemum and the Sword*. Boston, MA: Houghton Mifflin, 1946.
- Berger, Carl. *B-29 Superfortress*. New York, NY: Ballentine, 1970.
- Chant, Christopher. *World War II Aircraft*. London: Orbis, 1975.
- Clausewitz, Karl. *On War*. Baltimore, MD: Penguin, 1968.
- Coop, Dewitt S. *Forged in Fire*. Garden City, NY: Doubleday, 1982.
- Crane, Conrad. *Bombs, Cities, and Civilians*. Lawrence KS: University of Kansas Press, 1993.
- Craven, W., and J. Cate. *Army Air Forces in World War II*. Vol. 5. Chicago IL: University of Chicago Press, 1953.
- Dalleck, R. *FDR and American Foreign Policy, 1932-1945*. New York, NY: Oxford University Press, 1979.
- Douhet, Giulio. *The Command of the Air*. Translated by Dino Ferrar. New York, NY: Coward-McAnn, 1942.
- Dower, John. *War Without Mercy*. New York, NY: Random House, 1986.
- Federal Aviation Administration. *Flight Training Handbook*. Washington, DC: US Government Printing Office, 1980.
- Freeman, Roger. *The Mighty Eighth*. New York, NY: Orion, 1970.
- Griffith, C. *The Quest*. Maxwell Air Force Base, AL: Air University Press, 1999.
- Hansell, Haywood. *The Strategic Air War Against Germany and Japan*. Washington, DC: Office of USAF History, 1986.
- _____. "Harold George: Apostle of Air Power." In *Makers of the USAF*. Washington, DC: Office of USAF History, 1987.
- Haulman, D. *Hitting Home*. Washington, DC: Air Force History and Museum Program, 1999.

- Howard, M. *Studies in Peace and War*. New York, NY: Viking, 1971.
- LeMay, Curtis. *Superfortress*. New York, NY: Berkeley, 1989.
- _____. and Mickey Cantor. *Mission With LeMay*. Garden City, NY: Doubleday & Co, 1965.
- Marshall, Chester, and Warren Thompson. *Final Assault*. North Branch, MN: Specialty Press Publishing, 1995.
- Mitchell, William. *Winged Defense*. New York, NY: Putnam and Sons, 1925.
- Morrison, Wilbur. *Point of No Return*. New York, NY: Times Publishing, 1979.
- Morton, Lewis. "Germany First: The Basic Concept of Allied Strategy in World War II." In pub 70-7, *Command Decision*. Washington, DC: Center for Military History, 1959.
- Nalty, B. C. *Winged Shield, Winged Sword*. Washington, DC: Air Force History and Museums Program, 1997.
- Schaffer, Ronald. *Wings of Judgment*. New York, NY: Oxford University Press, 1985.
- Sherry, Michael. *The Rise of American Air Power*. New Haven, CT: Yale University Press, 1987.
- Sweeney, Charles. *War's End*. New York, NY: Avon Books, 1997.
- Walker, Samuel. *Prompt and Utter Destruction*. Chapel Hill, NC: University of North Carolina Press, 1997.
- Watts, D. C. *Restraints on War: Studies in the Limitations of Armed Conflict*. New York, NY: Oxford University Press, 1979.
- Weller, G. *Singapore is Silent*. New York, NY: Harcourt, Brace and Company, 1943.
- White, Graham. *Allied Aircraft Piston Engines of World War II*. Warrendale, PA: Society of Automotive Engineers, 1995.

Unpublished References

- Air Corps Tactical School Lecture, 28 March 1939. File 248.2019A. Air Force Historical Research Center. Maxwell Air Force Base, AL.
- Air Corps Tactical School Text, *The Air Force*, 1 December 1935, para 28, File 248.101.1. Air Force Historical Research Center. Maxwell Air Force Base, AL.

Air War Plans Division. Air War Planning Document-1, August 1941. Tab 2, Sec 2. Record Group 225. National Archive. College Park, MD.

Arnold, H. H. correspondence to Carl Spaatz, 24 January 1944. Box 14. Spaatz Papers. Library of Congress. Washington, DC.

Arnold, H. H. correspondence to Curtis LeMay, 21 March 1945. Box 11. LeMay Papers. Library of Congress. Washington, DC.

Brown, Squire. United States Air Force Museum. correspondence to John Curatola, 9 January 2002. 147 5th Artillery Road, Fort Leavenworth KS.

Combined Chiefs of Staff, Special Meeting Notes 71-86, 29 April 1943. Record Group 218. National Archives. College Park, MD.

Combined Chiefs of Air Staff Plan for the Defeat of Germany, Memo from Commanding General USAAF, 1 November 1943, Box 39, Arnold Papers, Library of Congress. Washington, DC.

Chennault, Claire correspondence to Curtis LeMay, 9 July 1945. Box 11. LeMay Papers. Library of Congress. Washington, DC.

Enclosure to Directive to Commanding General, United States Strategic Army Strategic Air Forces, Box 13. LeMay Papers. Library of Congress. Washington, DC.

Giles, B. correspondence to H. H. Arnold, 7 March 1945. 22 Jan-Mar 1945 Folder. Box 223. Arnold Papers. Library of Congress. Washington, DC.

Kuter, L. correspondence to H. H. Arnold, 9 August 1944. Box 153. Spaatz Papers. Library of Congress. Washington, DC.

LeMay, C. correspondence to H. H. Arnold, 19 October 1944. Box 11. LeMay Papers. Library of Congress. Washington, DC.

LeMay, C. correspondence to H. H. Arnold, 5 April 1945. Box 11. LeMay Papers. Library of Congress. Washington, DC.

LeMay, C. Speech notes, 19 November 1945. Box 41. LeMay Papers. Library of Congress. Washington, DC.

Operation Clarion Plan, 17 December 1944. File 670.430-3, February 1945. Air Force Historical Research Center. Maxwell Air Force Base, AL.

Operation Thunderclap Folder. Annex 1, 28 August 1944. Box 153. Spaatz Papers. Library of Congress. Washington, DC.

SHAEF correspondence to Spaatz, 28 August 1944. Box 18. Spaatz Papers. Library of Congress. Washington, DC.

Staff meeting notes, 23 December 1944. Box 16. Spaatz Papers. Library of Congress. Washington, DC.

Periodicals

Douhet, Giulio. "La Guerre del'Air" (Air Warfare). *Les Ailes*. Translated by Dorothy Benedict. Washington, DC; [1933] mimeograph copy.

"The Weather Problem in Bombing Japan," *Impact* 3, no. 2 (February 1945): 48-49.

"The M69 Goes to Work," *Impact*, 3, no. 4 (April 1945): 19. In *The Eve of Triumph*. Harrisburg PA: National Historic Society, 1989.

"Louseous Japanicas," *Leatherneck*, March 1945, 37.

Documents

Headquarters Army Air Force. *Aircraft Commanders Manual for the B-29*. Dayton, OH: Otterbein Press, 1945.

Office of Statistical Control. *Army Air Force Statistical Digest for WWII*. Washington, DC: US Government Printing Office, December 1945.

Serafini, S. D. "Clausewitz Condensed." Paper presented to Officer's Basic Course 15 February 1985, United States Army Training and Doctrine Command, Fort Monroe, Virginia.

Stephenson, Scott. "Breitenfeld: A Battle Piece" In *C600 Term I Syllabus/Book of Readings*. Ft Leavenworth: KS, Combat Studies Institute, US Army Command and General Staff College, 2001.

United States Strategic Bombing Survey (USSBS). *(European War) (Pacific War) Summary Report*. Washington, DC: US Government Printing Office, 1945 and 1946. Reprint; Maxwell Air Force Base AL: Air University Press. October 1987.

_____. *Overall Report (European War)*. Washington, DC: US Government Printing Office, 30 September 1945.

_____. *The Effects of Atomic Bombs on Hiroshima and Nagasaki*. Washington, DC: US Government Printing Office, 1946.

_____. *The Strategic Air Operation of Very Heavy Bombardment in the War Against Japan (Twentieth Air Force), Final Report*. Washington, DC: US Government Printing Office, 1 September 1946.

Electronic References

Federal Climate Complex. International Station Meteorological Climate Survey. Ver. 4.0, National Oceanographic and Atmospheric Association. Ashville, NC, 1996.

486th Bombardment Group Gallery. Available from <http://www.486th.org/photos/AC2/MkySet.htm>. Internet. Accessed 4 January 2002.

40th Bomb Group APQ-13 Radar Scope Mission Photos. Available from <http://www.40thbombgroup.org/hicks2.html>. Internet. Accessed 4 January 2002.

B-29 Virtual Tour, Bomb and Weapons. Available from <http://www.airandseamodels.com/Demo/b29/tour-weapons.html>. Internet. Accessed 4 January 2002.

INITIAL DISTRIBUTION LIST

1. Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314
2. Defense Technical Information Center/OCA
8725 John J. Kingman Rd., Suite 994
Fort Belvoir VA, 22060-6218
3. Marine Corps Command and General Staff College
Breckenridge Library
MCCDC
Quantico, VA 22134
4. Christopher R. Gable
Combat Studies Institute
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352
5. Joseph G. D. Babb
Department of Joint and Multinational Operations
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352
6. Thomas J. Toomer
United States Air Force Element
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT

1. Certification Date: 31 May 2002
2. Thesis Author: Major John M. Curatola USMC
3. Thesis Title: No Quarter Given: The Change in Strategic Bombing Application in the Pacific Theater
4. Thesis Committee Members Christopher R. Gabel, Ph.D. _____
Signatures: Joseph G. D. Babb, M.A. _____
Major Thomas J. Toomer, M.S. _____

5. Distribution Statement: See distribution statements A-X on reverse, then circle appropriate distribution statement letter code below:

A B C D E F X

SEE EXPLANATION OF CODES ON REVERSE

If your thesis does not fit into any of the above categories or is classified, you must coordinate with the classified section at CARL.

6. Justification: Justification is required for any distribution other than described in Distribution Statement A. All or part of a thesis may justify distribution limitation. See limitation justification statements 1-10 on reverse, then list, below, the statement(s) that applies (apply) to your thesis and corresponding chapters/sections and pages. Follow sample format shown below:

EXAMPLE

<u>Limitation Justification Statement</u>	<u>/</u>	<u>Chapter/Section</u>	<u>/</u>	<u>Page(s)</u>
Direct Military Support (10)	/	Chapter 3	/	12
Critical Technology (3)	/	Section 4	/	31
Administrative Operational Use (7)	/	Chapter 2	/	13-32

Fill in limitation justification for your thesis below:

<u>Limitation Justification Statement</u>	<u>/</u>	<u>Chapter/Section</u>	<u>/</u>	<u>Page(s)</u>
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____

7. MMAS Thesis Author's Signature: _____

STATEMENT A: Approved for public release; distribution is unlimited. (Documents with this statement may be made available or sold to the general public and foreign nationals).

STATEMENT B: Distribution authorized to U.S. Government agencies only (insert reason and date ON REVERSE OF THIS FORM). Currently used reasons for imposing this statement include the following:

1. Foreign Government Information. Protection of foreign information.
2. Proprietary Information. Protection of proprietary information not owned by the U.S. Government.
3. Critical Technology. Protection and control of critical technology including technical data with potential military application.
4. Test and Evaluation. Protection of test and evaluation of commercial production or military hardware.
5. Contractor Performance Evaluation. Protection of information involving contractor performance evaluation.
6. Premature Dissemination. Protection of information involving systems or hardware from premature dissemination.
7. Administrative/Operational Use. Protection of information restricted to official use or for administrative or operational purposes.
8. Software Documentation. Protection of software documentation - release only in accordance with the provisions of DoD Instruction 7930.2.
9. Specific Authority. Protection of information required by a specific authority.
10. Direct Military Support. To protect export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize a U.S. military advantage.

STATEMENT C: Distribution authorized to U.S. Government agencies and their contractors: (REASON AND DATE). Currently most used reasons are 1, 3, 7, 8, and 9 above.

STATEMENT D: Distribution authorized to DoD and U.S. DoD contractors only; (REASON AND DATE). Currently most reasons are 1, 3, 7, 8, and 9 above.

STATEMENT E: Distribution authorized to DoD only; (REASON AND DATE). Currently most used reasons are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

STATEMENT F: Further dissemination only as directed by (controlling DoD office and date), or higher DoD authority. Used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1-R.

STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals of enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25; (date). Controlling DoD office is (insert).